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Bierbower et al.

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(54) **FOLDABLE BOAT COVER**

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B63B 17/02 (2006.01)

(52) **U.S. Cl.** **114/361**; 135/88.01

(58) **Field of Classification Search** 114/361; 135/88.01, 90, 96
See application file for complete search history.

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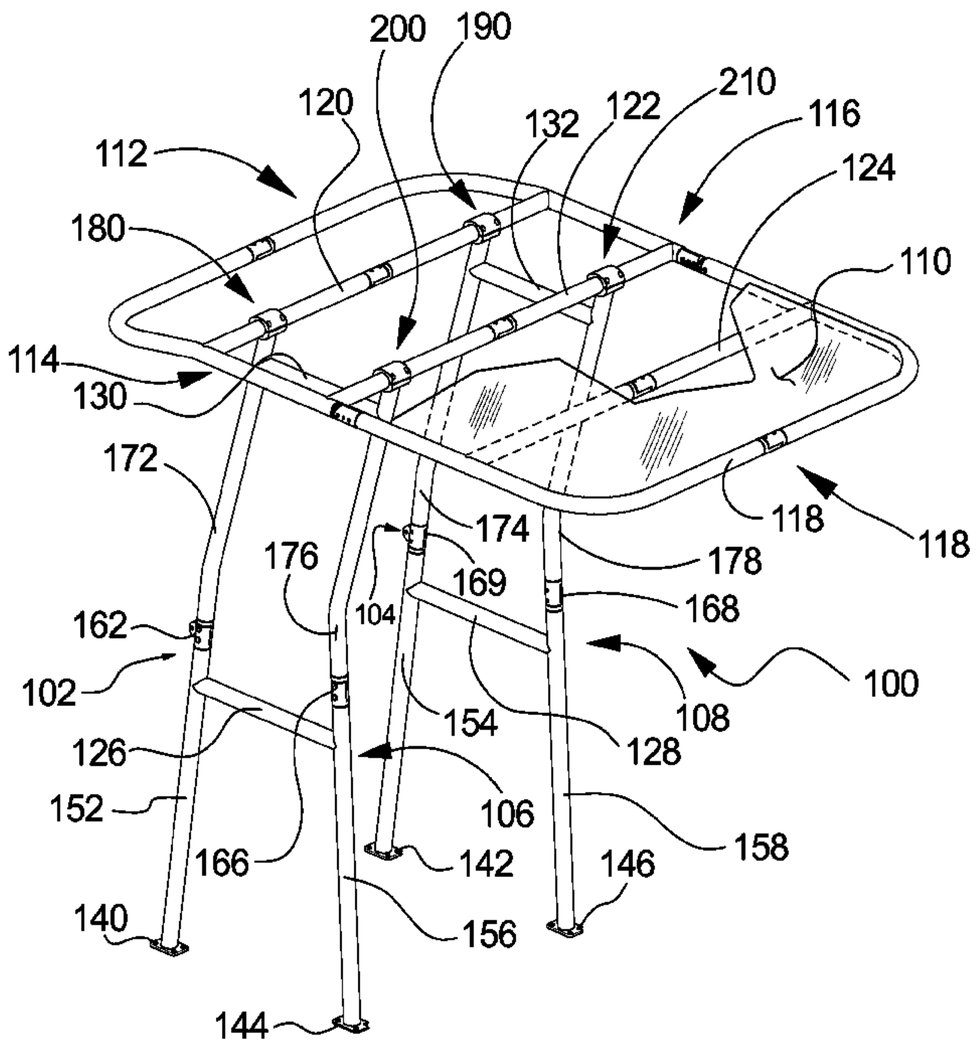
(57) **ABSTRACT**

Foldable boat covers provide various features including a cover portion which is foldable. Other features include hinges allowing the base structure to be folded. By folding the cover portion, the base structure, or both the cover portion and base structure, the boat may be placed in a garage or on a covered boat lift with a lesser likelihood of the boat cover interfering.

18 Claims, 19 Drawing Sheets



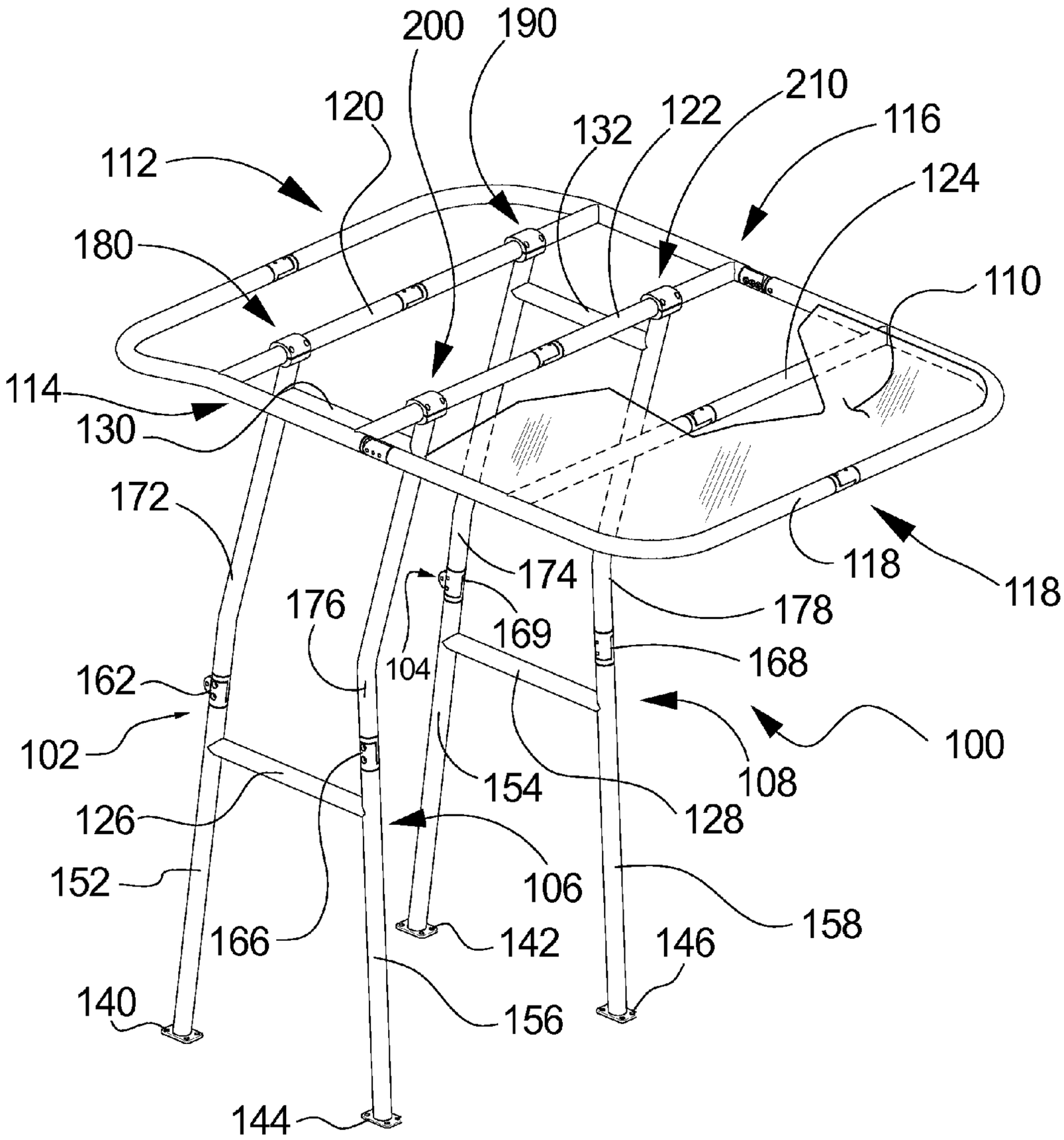

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FIG. 1

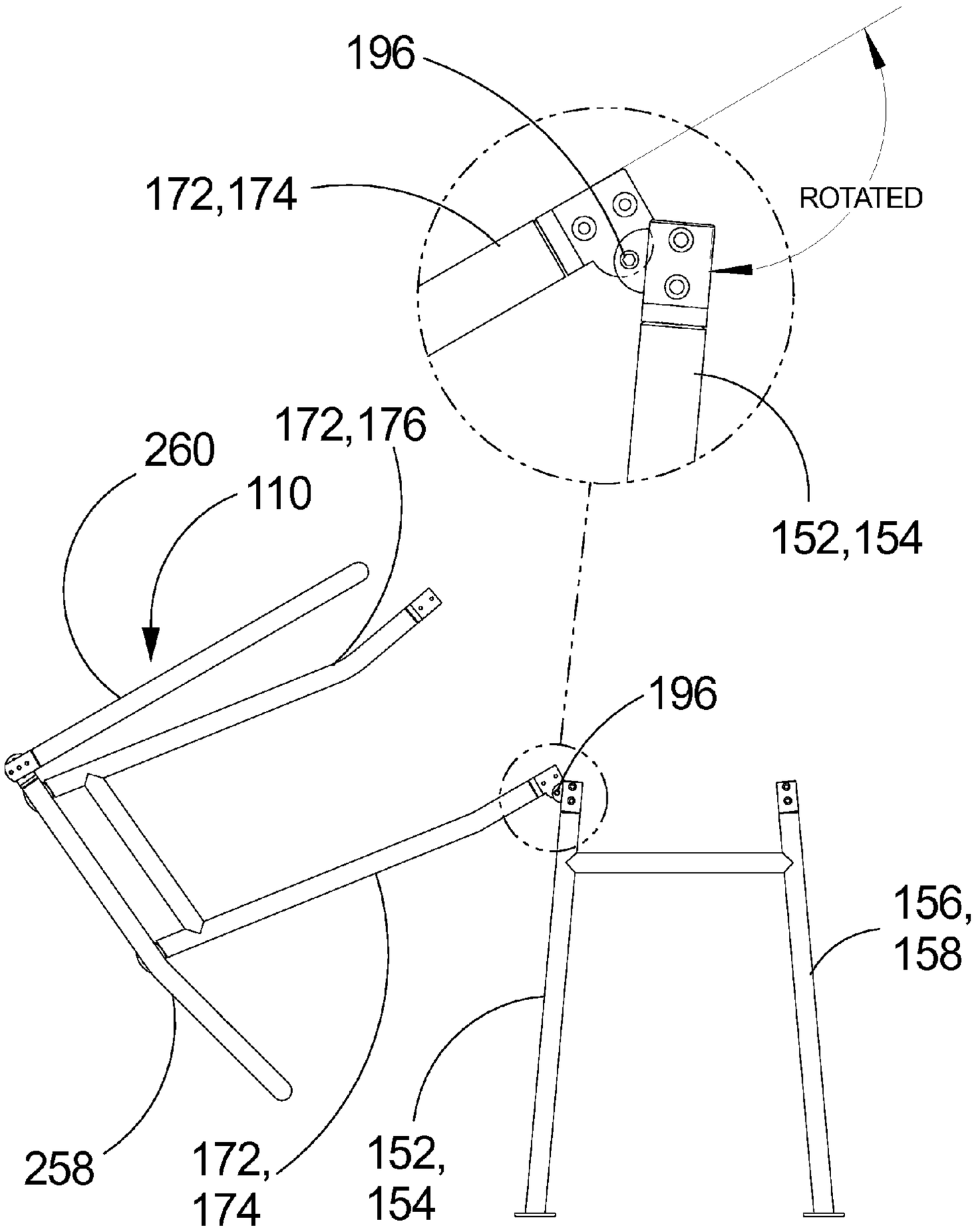
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FIG. 2

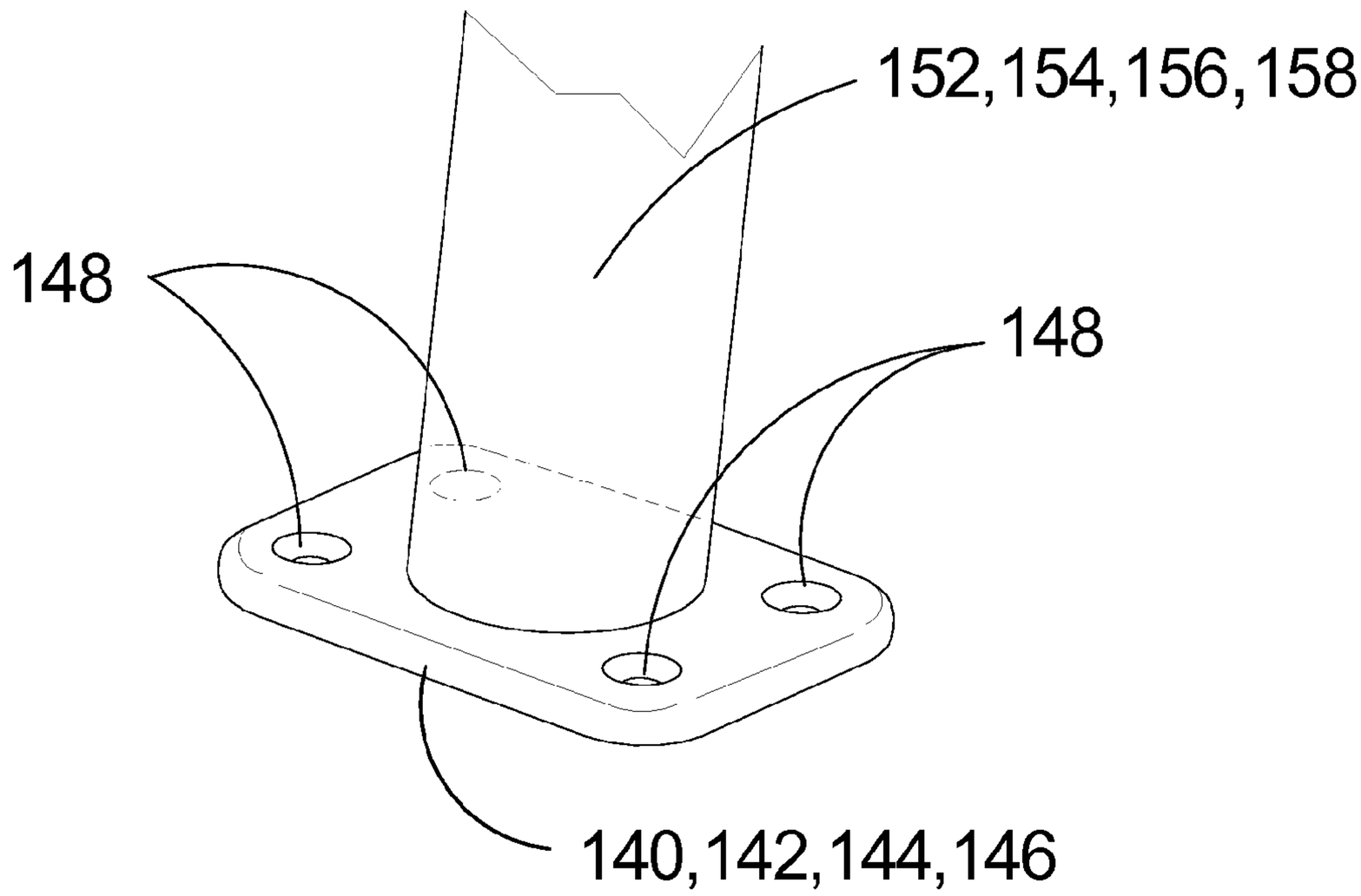

FIG.3

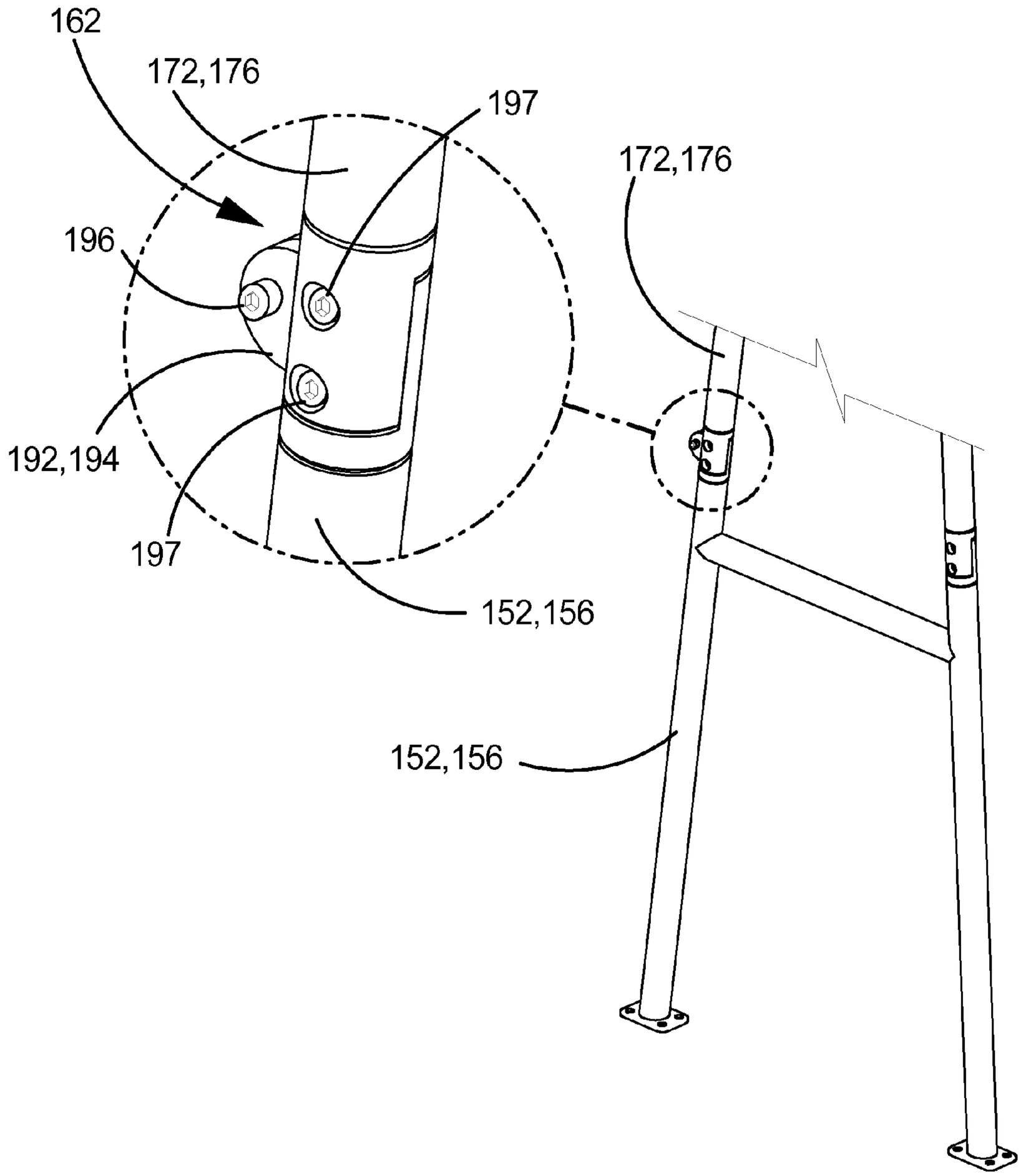

FIG. 4

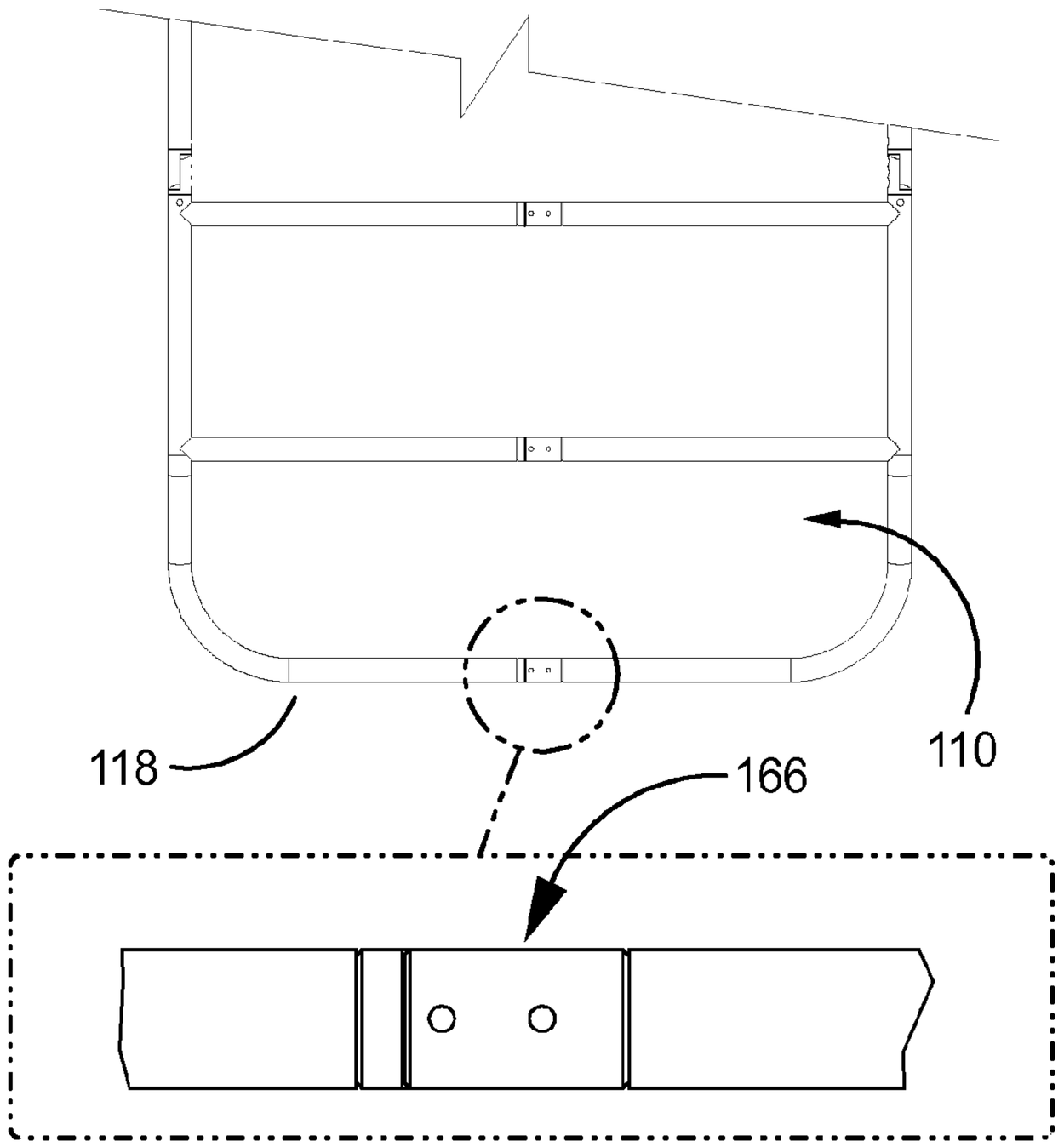

FIG. 5A

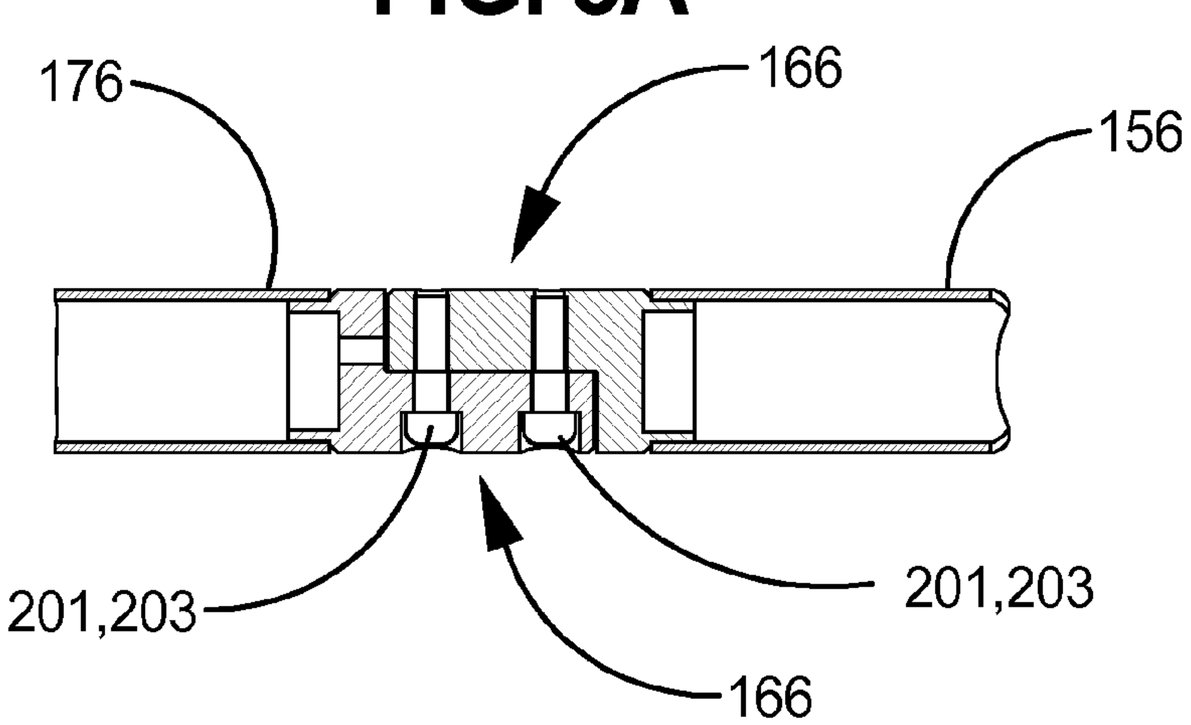

FIG. 5B

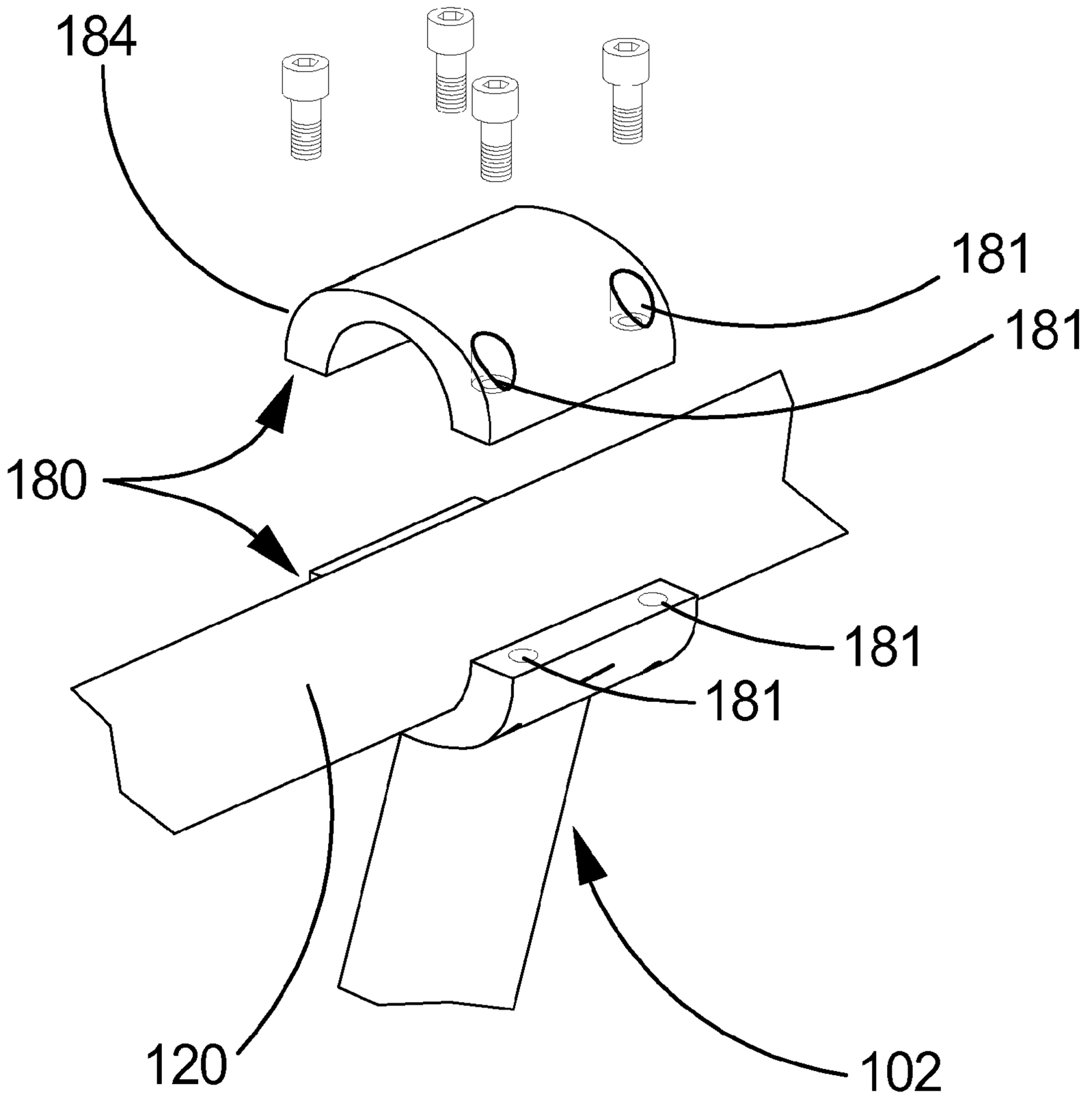

FIG. 6

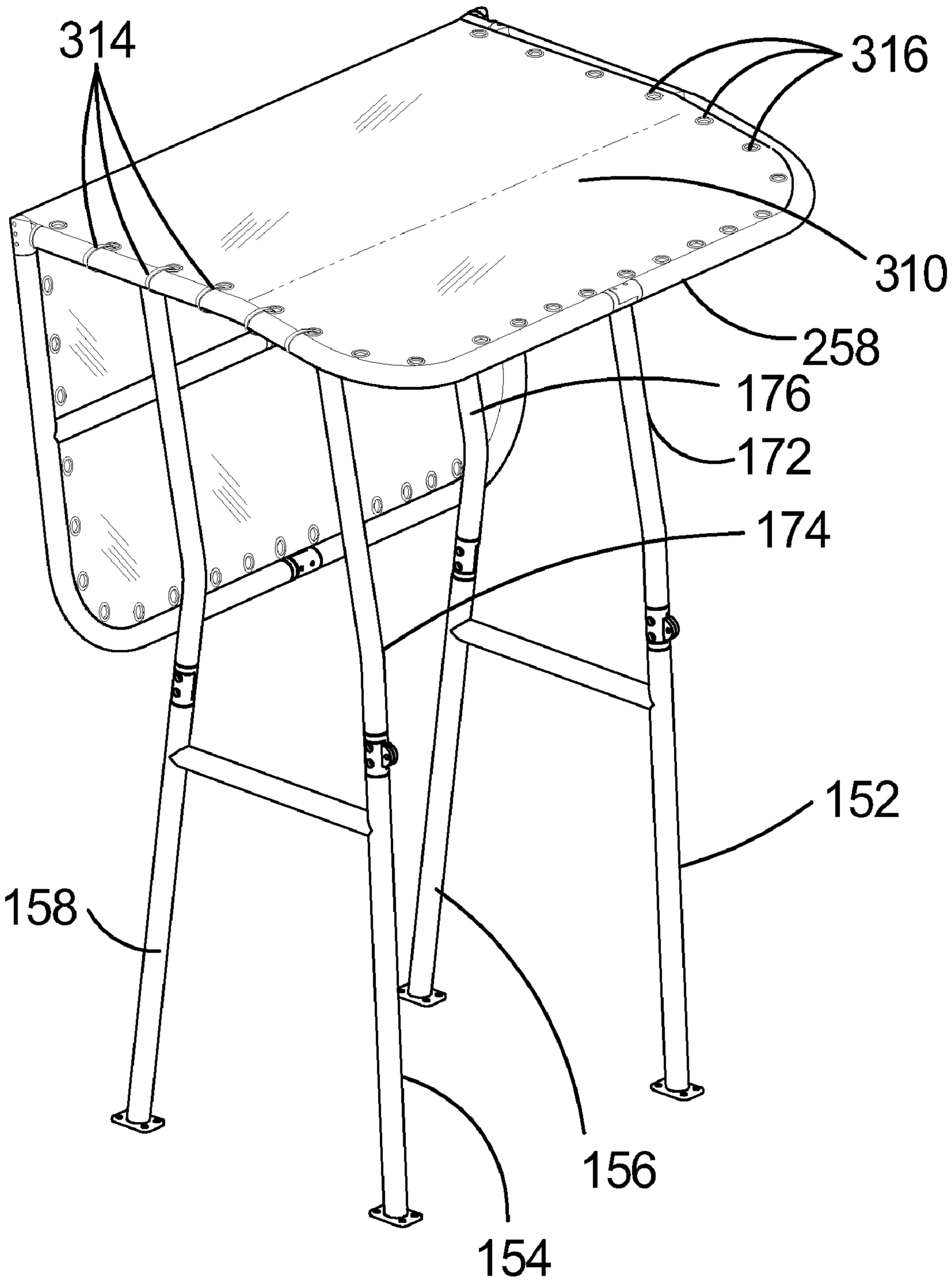

FIG. 7

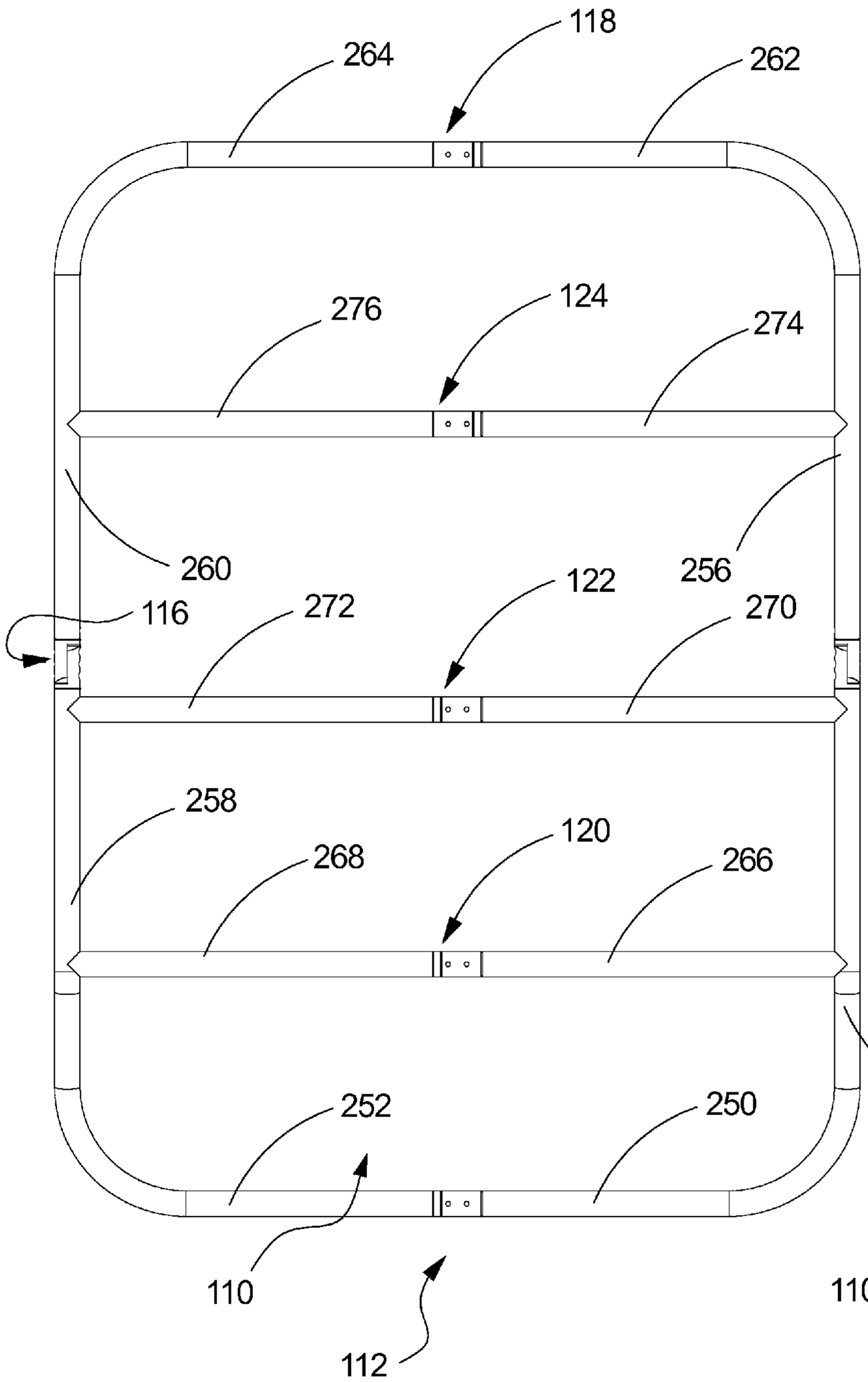
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FIG. 8A

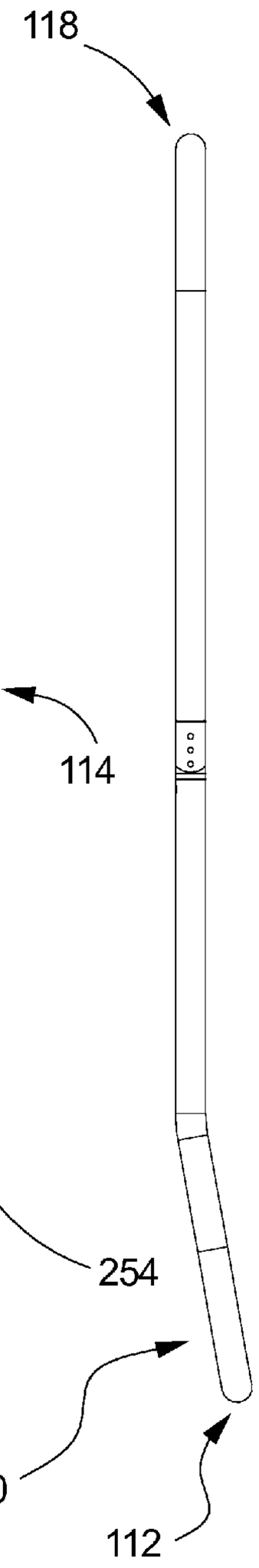
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FIG. 8B

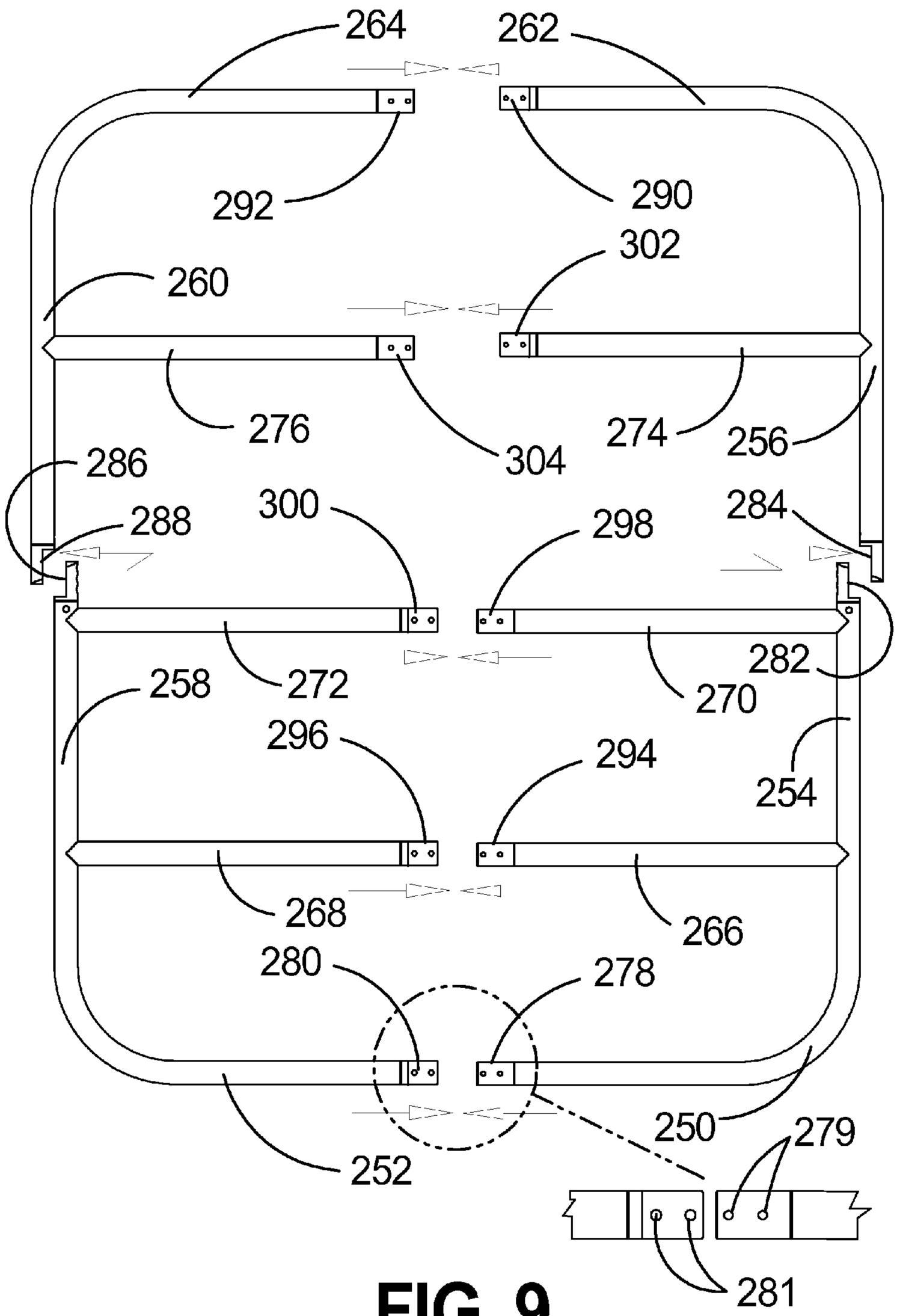
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FIG. 9

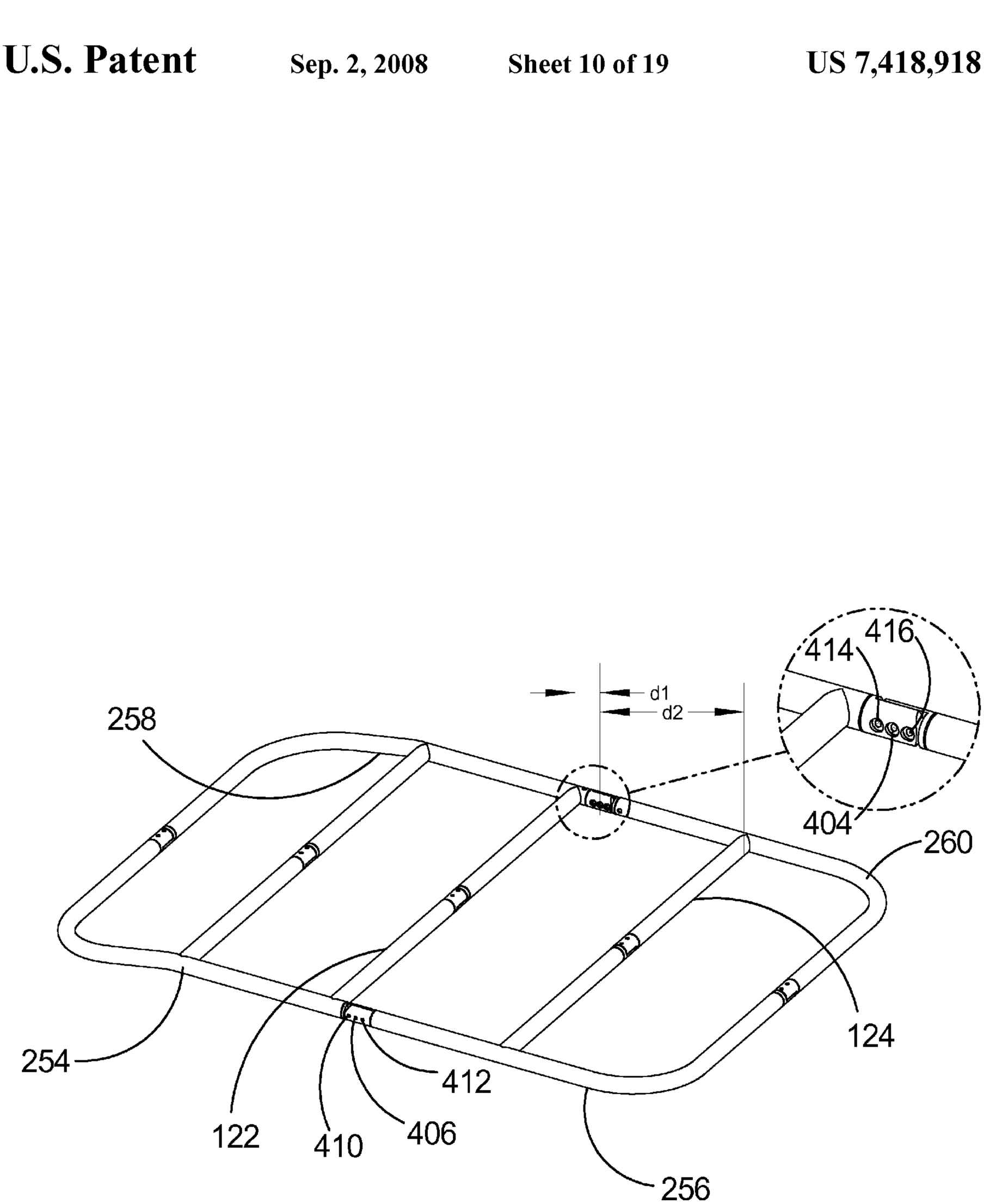

FIG. 10A

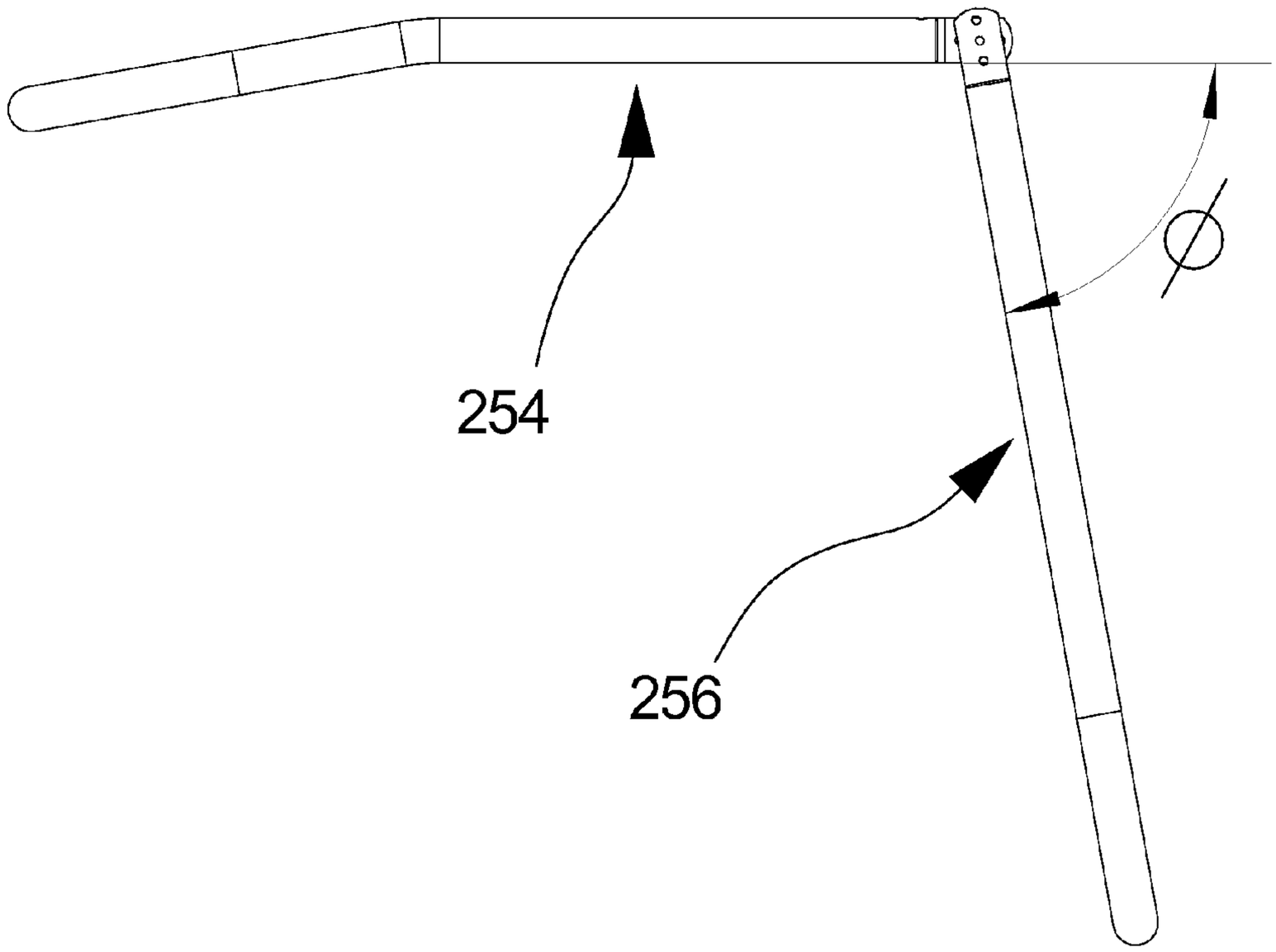

FIG. 10B

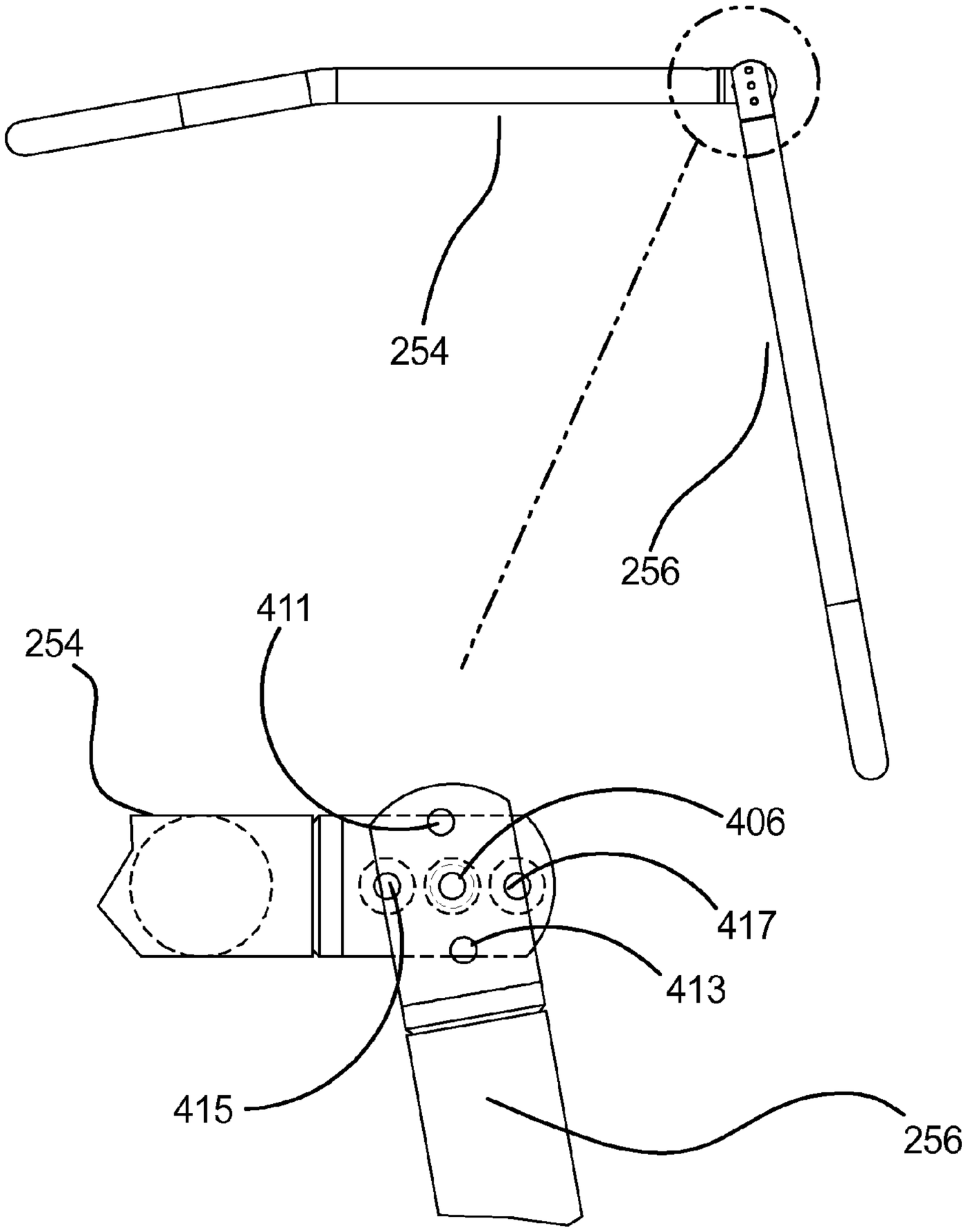

FIG. 10C

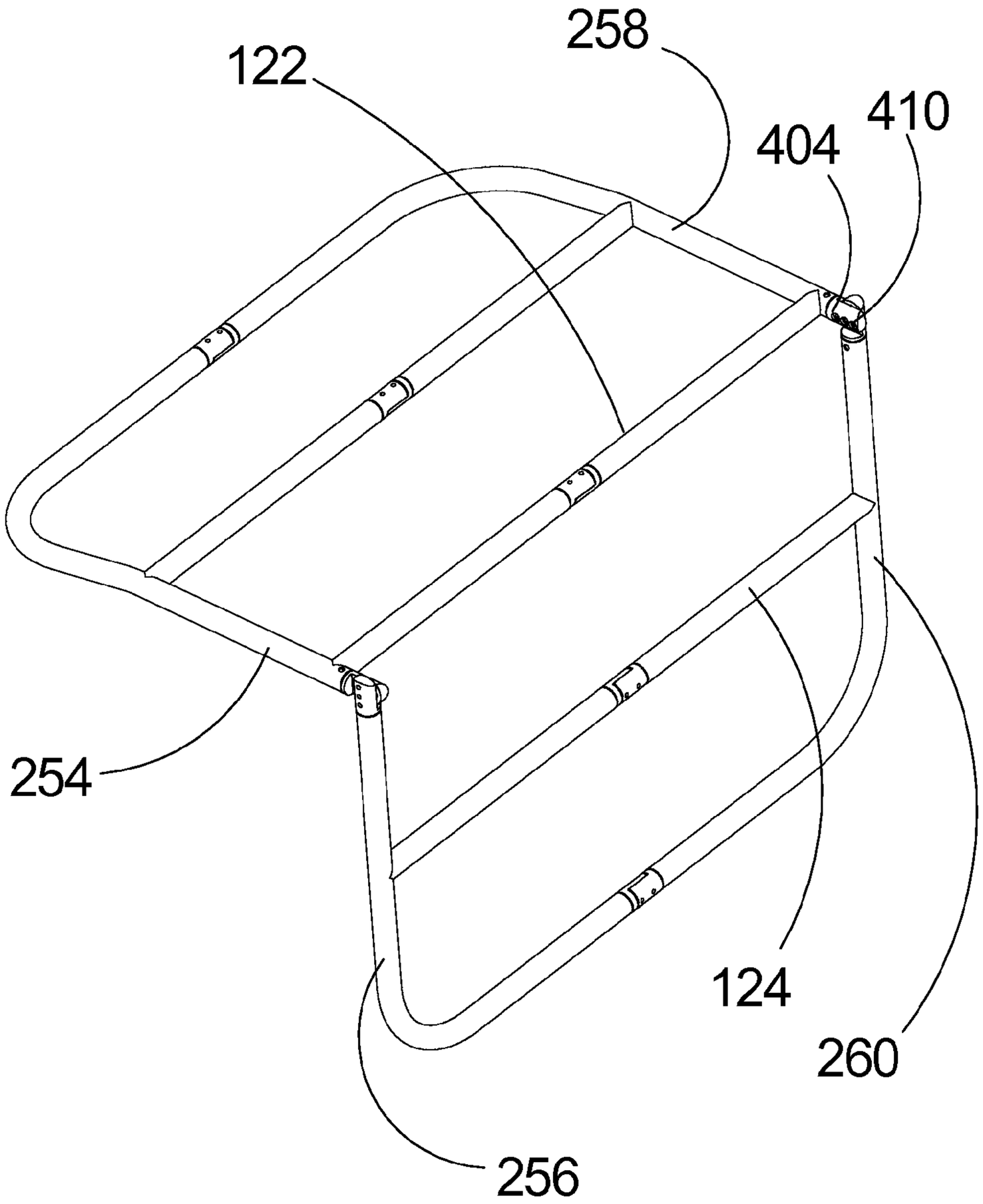

FIG. 10D

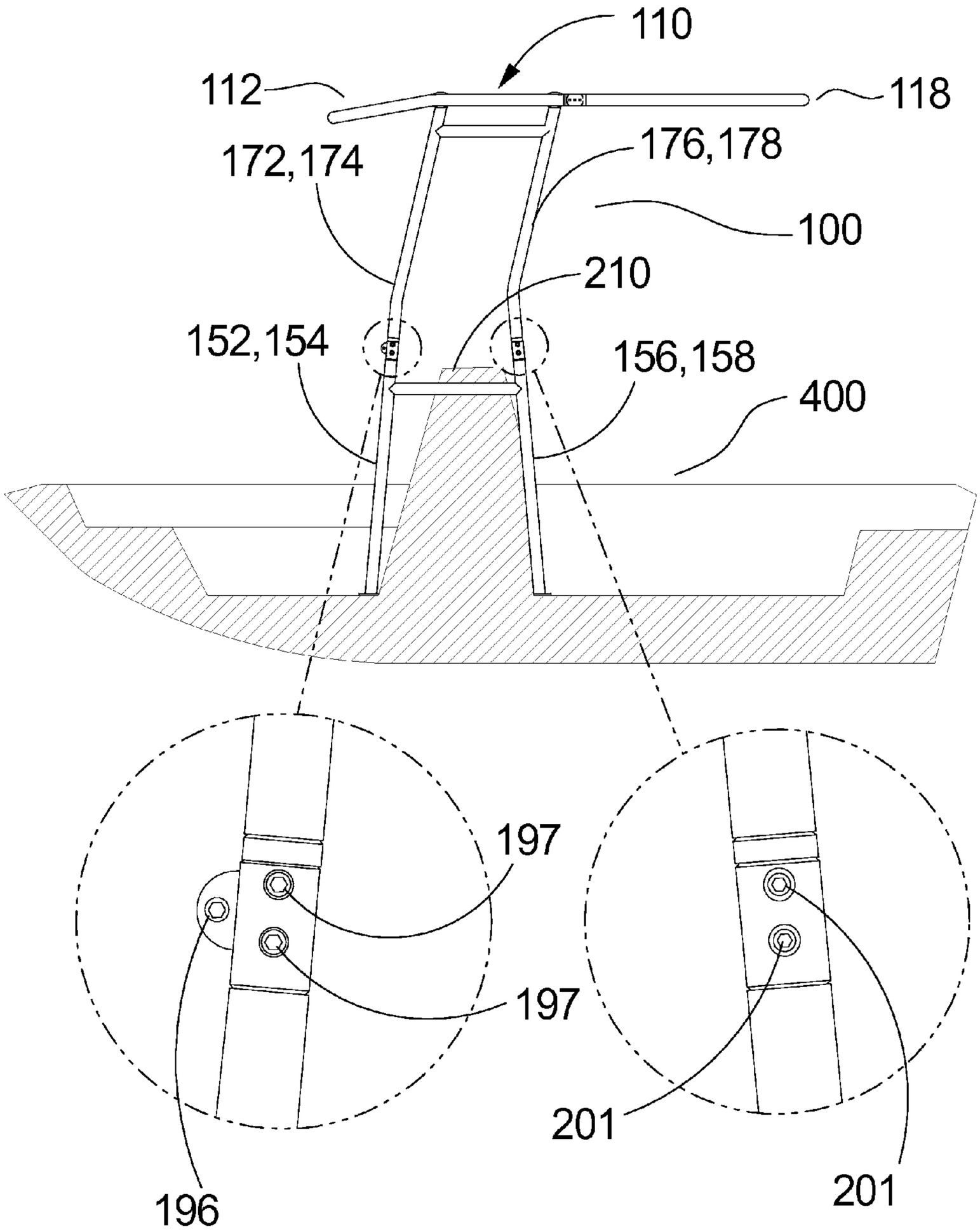
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FIG. 11A

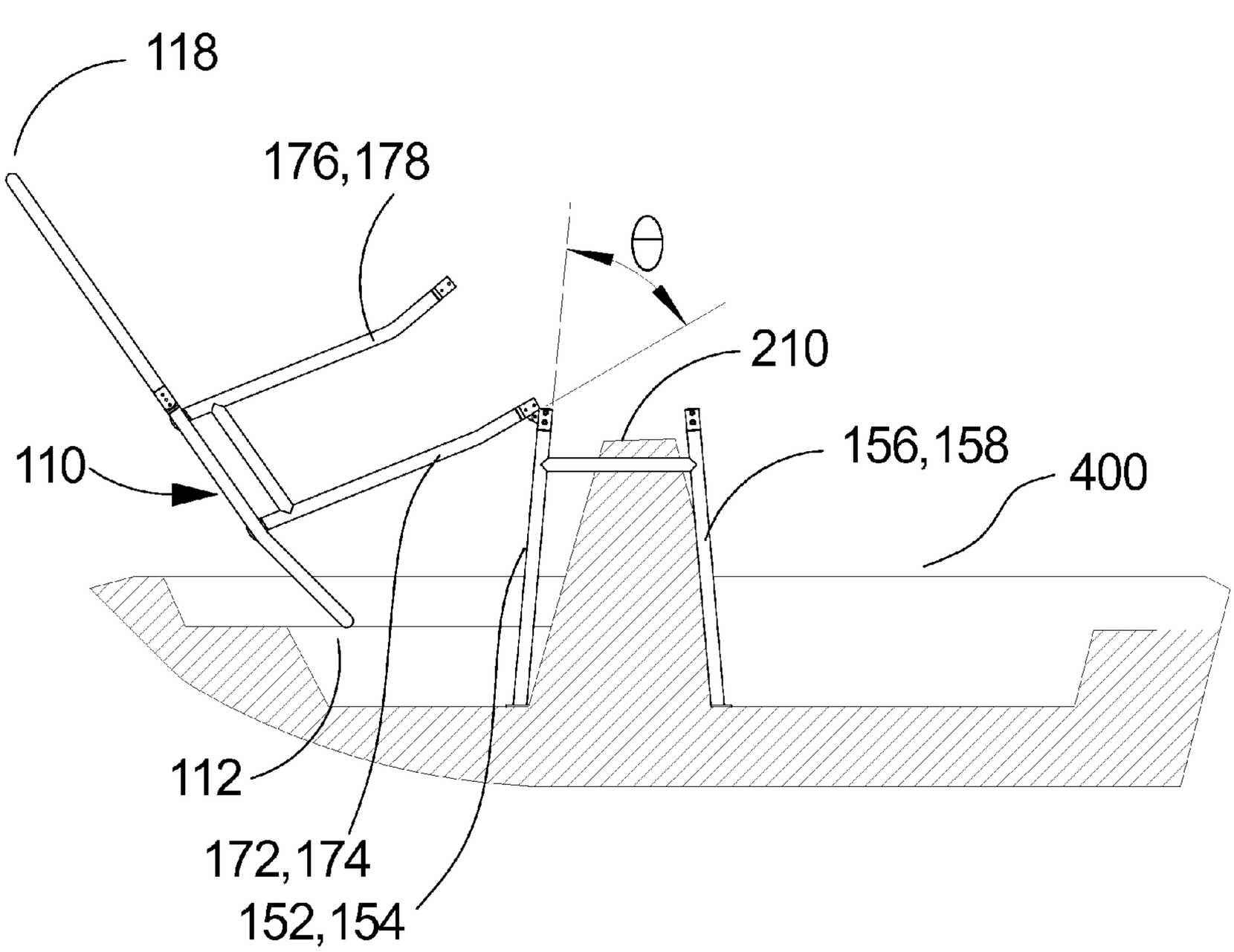

FIG. 11B

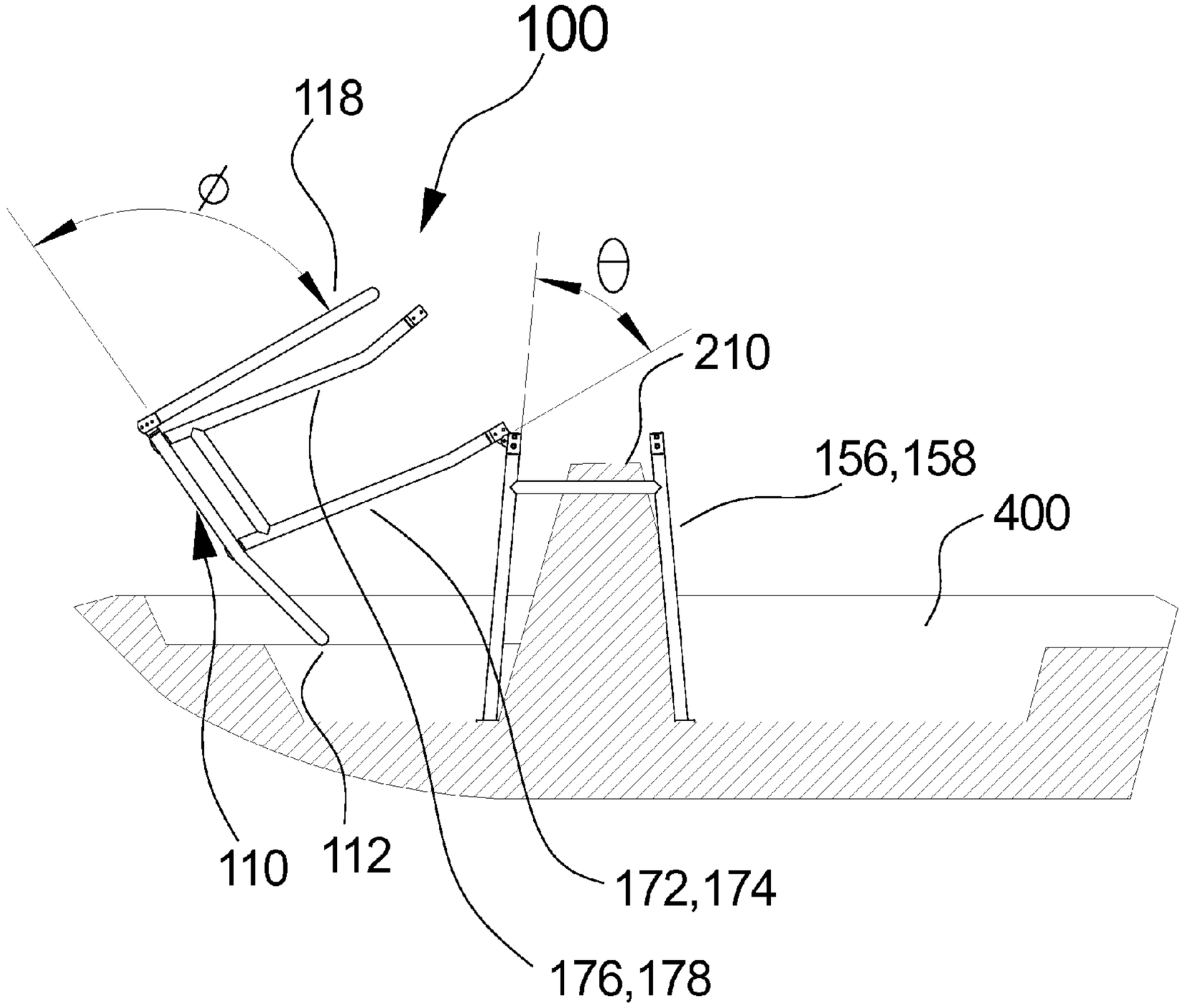

FIG. 11C

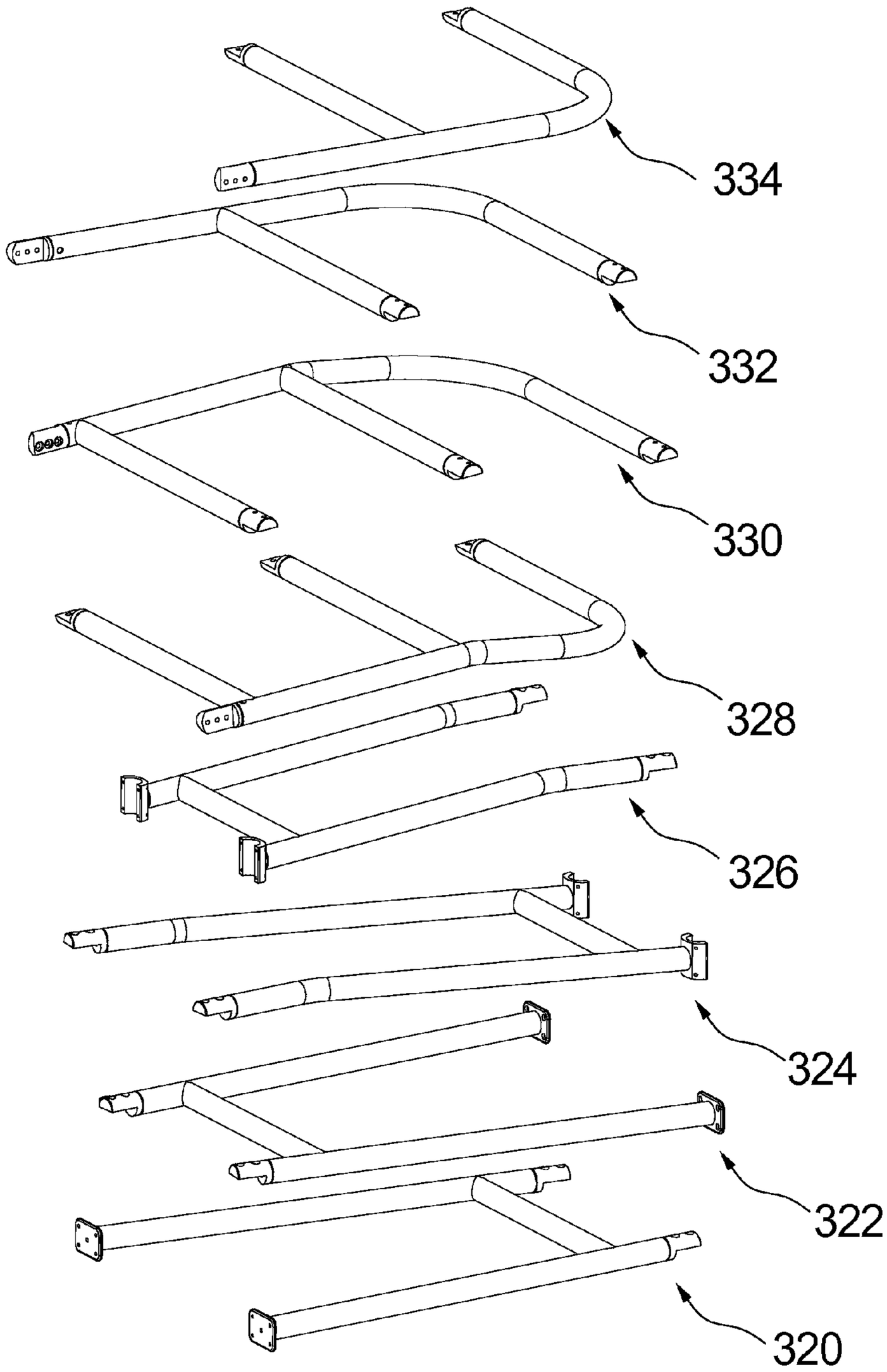

FIG. 12

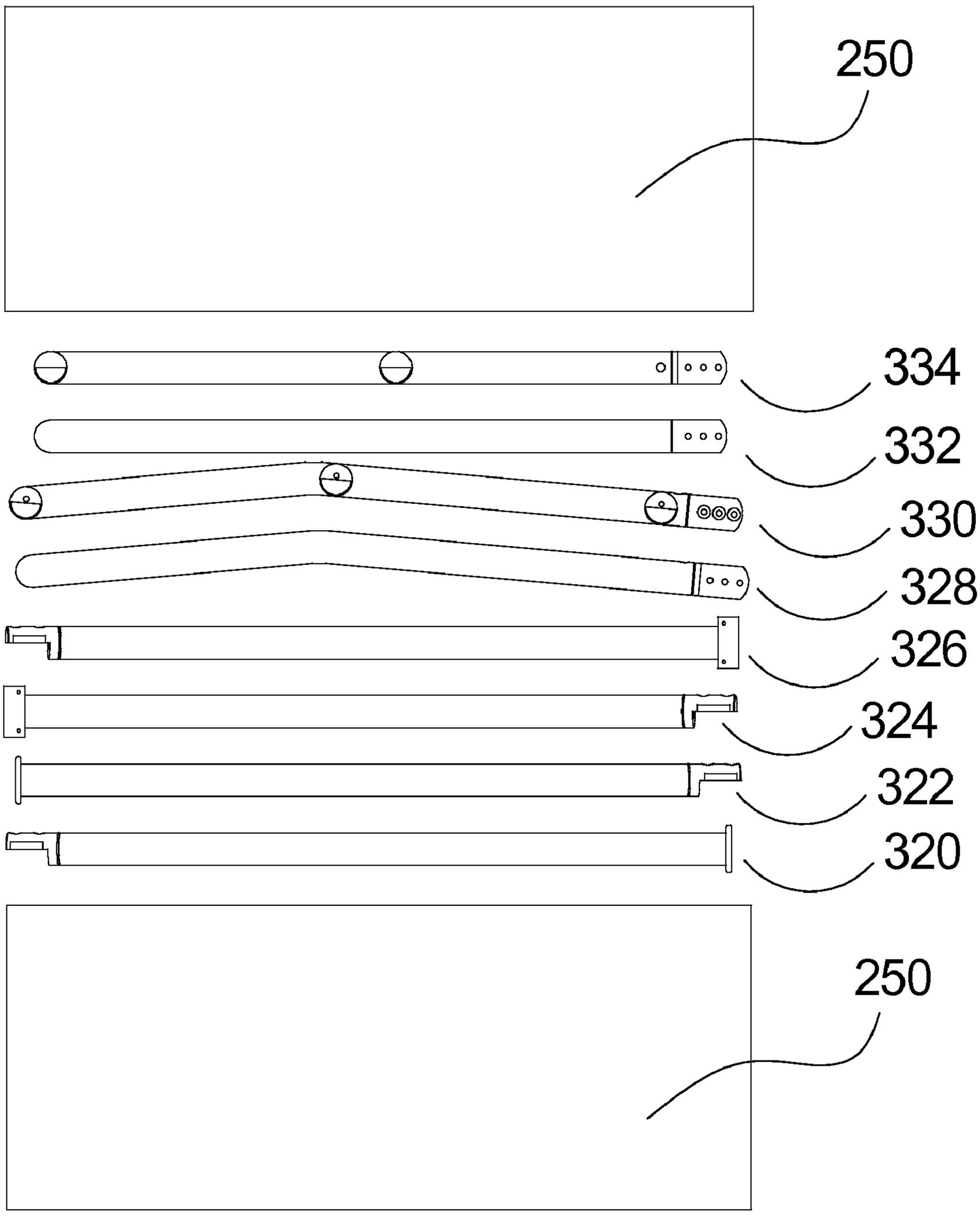

FIG.13

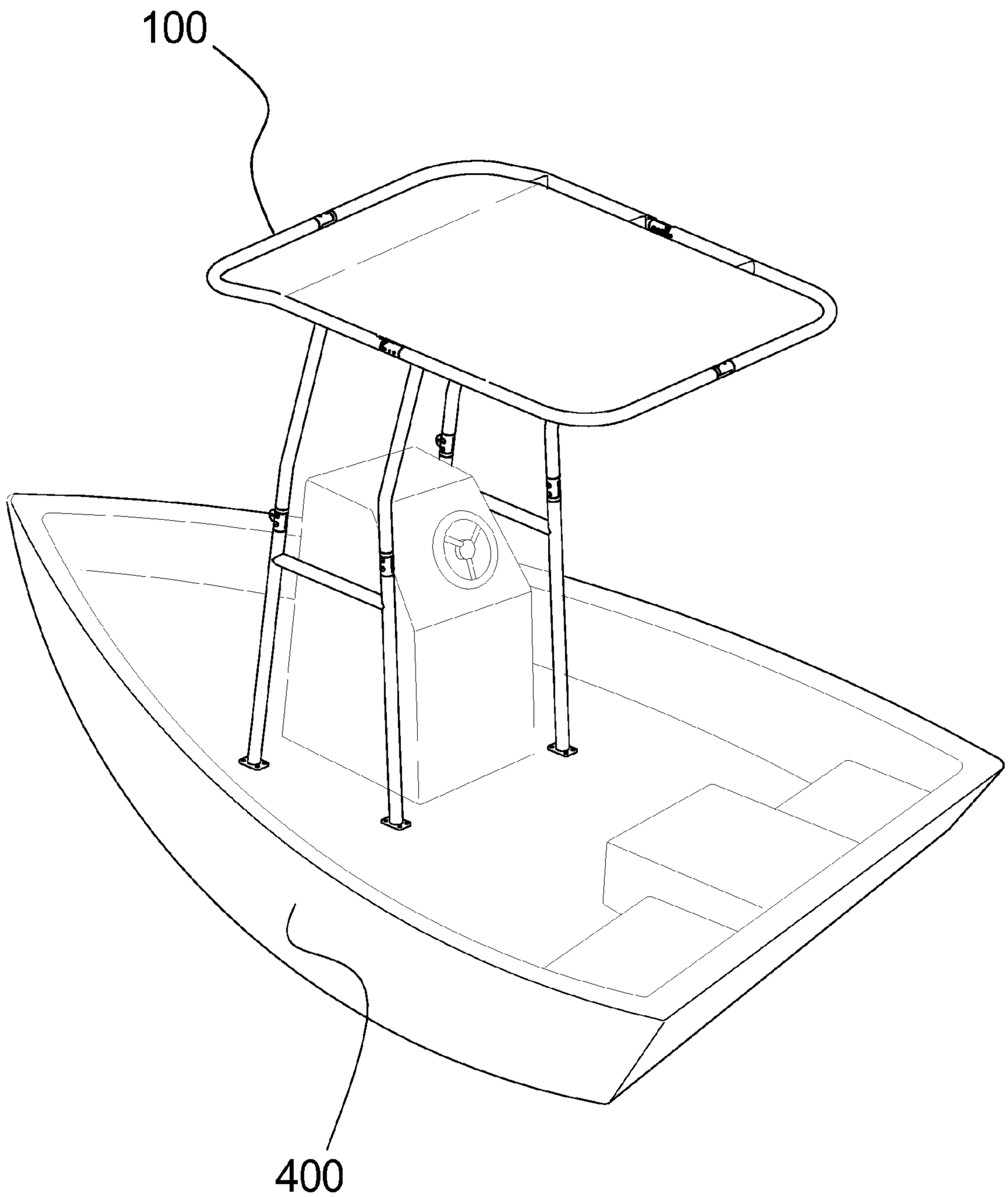

FIG. 14

FOLDABLE BOAT COVER

TECHNICAL FIELD

Embodiments relate to foldable boat covers installed on boats for providing protection from the elements, for example sun and rain, and to provide a place to stow or mount equipment for fishing and general boating activities.

BACKGROUND

Boat covers allow enthusiasts to be protected from the elements and also to stow equipment as well as provide a place to mount antennas, rod holders, etc. for a boat that the boat cover is mounted on. Simple boat covers are essentially a generally flat cover supported by four legs which are attached to the boat.

Boat covers provide shelter and protection for passengers on the boat as well as for the boat itself including electronics and other equipment. Various styles and configurations of boat covers are commonly known in the prior art. One conventional boat cover is a tee-top ("T-top"), which consists of a framework attached to the center console and/or decks of the boat. Conventional boat cover assemblies comprise a boat cover that is permanently and inflexibly secured such that, once installed, the cover's position and orientation never change, other than to be partially or completely removed from the boat.

A further problem with custom-made boat covers is that they maintain a fixed position. As a result of this fixed positioning, the boat must be stored in a special housing that has ample room for the added height of the fixed boat cover. More specifically, a boat having a custom built boat cover usually cannot be stored in a standard size garage or a commercial covered marine storage facility because of the standard height of the boat cover.

SUMMARY

Illustrative embodiments address these issues and others by providing boat covers that include various features absent in earlier boat covers. Features of some embodiments provide for a device that can be folded down in one or more ways to allow an overhead lift to be used, as well as storage in home garages and typical boat storage facilities.

One embodiment of a boat cover includes a cover portion including a plurality of attachment points and at least one hinge. The cover portion has a front portion, a back portion, a first side portion and a second side portion. A first leg includes a distal end and a proximal end, wherein the distal end provides a boat attachment point and the proximal end provides a cover attachment point. A second leg includes a distal end and a proximal end, the distal end provides a boat attachment point and the proximal end provides a cover attachment point. A third leg includes a distal end and a proximal end, the third leg linked to the cover portion. A fourth leg including a distal end and a proximal end, and the fourth leg is linked to the cover portion. The cover portion has a first position in which the cover portion is extended and a second position in which the cover portion is folded about the at least one hinge.

Another embodiment is a boat cover that includes a cover portion including at least one hinge such that the cover portion has at least two positions, an extended position and a folded position. The cover portion is supported by at least one of a plurality of legs. In an exemplary embodiment, the cover portion comprises a front portion, a first side portion, a second side portion and a back portion.

Another embodiment is a method of folding a boat cover that has two front legs, two rear legs and a cover portion and that is mounted to a boat. The method comprises rotating an upper section of each of the two front legs relative to a lower section of each of the two front legs until a front portion of the cover portion comes to rest in a reclined position. The method also comprises rotating a back portion of the cover either toward the bow or aft of the boat until the back portion comes to rest in a reclined position.

Another embodiment is a method of packaging components of a boat cover including a cover portion, a plurality of legs and a screen. The method involves positioning the plurality of legs side by side. The method further involves positioning the plurality of members comprising the cover portion side by side in a stacked configuration next to the plurality of legs.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of an embodiment in an upright state.

FIG. **2** is a side view of the embodiment of FIG. **1** in a folded state showing an exemplary joint in a pivoted condition.

FIG. **3** is an enlarged view of the base member of the embodiment of FIGS. **1-2**.

FIG. **4** is a perspective view of an exemplary joint between upper and lower sections of front legs of the embodiment such as the joint of FIG. **2**.

FIG. **5**A is a side view of an exemplary joint between select members of an exemplary embodiment.

FIG. **5**B is a frontal cross-sectional view of the exemplary joint of FIG. **5**A between select members of an exemplary embodiment.

FIG. **6** is an enlarged exploded view of a clamshell-type clamp portion of the embodiment of FIGS. **1-2**.

FIG. **7** is a side view of the embodiment of FIG. **1** in a transition state between the upright state of FIG. **1** and the folded state of FIG. **2**.

FIGS. **8**A and **8**B are side and top views, respectively, of the cover portion of the exemplary embodiment of FIGS. **1-2**.

FIG. **9** is a top view of the cover portion of the embodiment of FIG. **8**A-**8**B in a disassembled state.

FIG. **10**A is a perspective view of an exemplary cover portion of an exemplary embodiment.

FIG. **10**B is a side view of an exemplary hinge portion of the exemplary cover portion of FIG. **10**A in a partially folded state.

FIG. **10**C is a partial sectional frontal view of the exemplary hinge portion of FIG. **10**B.

FIG. **10**D is a perspective view of the exemplary cover portion of FIGS. **10**A-C in a partially folded state.

FIG. **11**A is a side view showing an exemplary cover mounted to a boat and in an upright state.

FIG. **11**B is a side view showing the exemplary cover mounted to a boat and in a partially folded state.

FIG. **11**C is a side view showing the exemplary cover mounted to a boat and in a completely folded state.

FIG. **12** is a perspective view of an arrangement of various members of an exemplary boat cover according to the embodiment.

FIG. **13** is a side view of the various members of FIG. **12** arranged for packaging.

FIG. **14** is a perspective view of an embodiment in an upright state and mounted to a boat.

DETAILED DESCRIPTION

Illustrative embodiments include boat covers and associated methods of folding boat covers from an upright state to a folded state. Features of certain embodiments provide for compact packaging to transport the boat cover.

As noted above, such boat covers may be used to stow or mount equipment such as electronics including, for example, graphs and radios, as well as for providing protection from the elements such as protecting persons, and equipment, from the sun and rain. However, it will be appreciated that stowing and mounting objects on a boat cover presents additional dangers to persons and equipment and also poses a greater risk of damage to the boat upon which the device is mounted.

FIGS. **1-14** show various views of an illustrative embodiment **100** of a boat cover. Boat cover **100** of this particular embodiment includes two front legs **102**, **104**, two rear legs **106**, **108** and cover portion **110**. As illustrated in FIGS. **1-2**, the front legs **102**, **104** of this embodiment are shown to be generally straight while the rear legs are curved or bent. However, it will be appreciated that the various legs may be straight, curved or bent in one or more planes.

FIGS. **1** and **14** illustrate an exemplary embodiment of boat cover **100** in an upright state, the boat cover **100** being mounted to a boat **400** in FIG. **14**, whereas FIG. **2** illustrates boat cover **100** in a folded state. FIG. **7** illustrates boat cover **100** in a transition position between the upright position of FIG. **1** and the folded position of FIG. **2** and further illustrating an optional screen **310**.

Generally, the illustrated embodiment consists of a base structure including plurality of legs **102**, **104**, **106**, **108** and a cover portion **110**.

I. Boat Cover Components

Boat covers may comprise one or more of the following components.

A. Base Structure

Various embodiments of boat covers may comprise a base structure and a cover portion. The base structure comprises one or more legs which support cover portion **110**. The base structure may also comprise one or more attachment means for securing the legs to a boat floor and center console and it may include one or more clamps which may be used to secure the legs to the cover portion at respective attachment points. FIGS. **1-2** illustrate an exemplary boat cover in which the base structure includes two front legs **102**, **104**, two rear legs **106**, **108**, base members **140**, **142**, **144**, **146**, and clamps **180**, **190**, **200**, **210**.

As illustrated in the exemplary embodiment of FIG. **1**, legs **102**, **104**, **106**, **108** include respective base members **140**, **142**, **144**, **146**, at distal ends of the legs in order to mount the base structure to a boat or other structure for which a suitable cover may be useful including, but not limited to, all terrain vehicles, pontoons, rigid inflatables, and docks. Each base member **140**, **142**, **144**, **146**, includes a plurality of mounting holes **148** (shown in more detail in FIG. **3**) through which a plurality of mounting bolts or screws (not shown) extend in order to secure the legs to the boat deck (marine adhesive may also be used). Note that the various screws or bolts of the present embodiment may each include a knob that enables a user to loosen and tighten the bolt by hand to make releasing the legs and the cover portion from the boat a quick and easy task. Also note that although illustrated using bolts and mounting plates to fixedly attach the legs to the boat, various means including, but not limited to, hinge, swivel, and slidable connections are suitable as well for embodiments where it is desirable for the legs to pivot or rotate, such as may be desired in order for the legs to be able to relieve stress or in order to make the structure adaptable to fit various boat geometries. It will also be appreciated that in some embodiments, the legs may be fixed by other means than bolts and mounting plates, such as, for example, by gluing, bonding or welding.

As discussed above and illustrated in FIGS. **2** and **7**, the base structure may be foldable. In particular, FIG. **2** illustrates that the various legs **102**, **104**, **106**, **108** may comprise multiple segments. For example, front leg **102** may comprise a lower section **152**, a hinge **162** and an upper section **172**. Likewise front leg **104** may comprise a lower section **154**, a hinge **164** and an upper section **174**. Similarly, rear leg **106** may comprise respective lower section **156**, joint **166** and upper section **176** and rear leg **108** may comprise respective lower section **158**, joint **168** and upper section **178**.

FIG. **4** in conjunction with FIG. **2** illustrates a perspective view and side/cross-sectional view, respectively, of a representative hinge **162** which may be utilized between leg **102**'s lower section **152** and upper section **172**. It will be appreciated that various hinges and other means may be utilized to connect the various leg sections and that hinge **162** is illustrative only. The exemplary embodiment of FIG. **4** include a lower flange **192** extending from lower section **152**, an upper flange **194** extending from upper section **172** and a bolt **196** extending between the flanges **192**, **194**. Bolt **196** allows upper flange **194**/upper section **172** to be pivoted about lower flange **192**/lower section **152**. In this embodiment, offsetting bolt **196** allows upper section **172** to be pivoted from a position in which it is in line with lower section **152** (i.e., where the angle between the sections is approximately 0 degrees) to a position in which upper section **172** is almost parallel to lower section **152** (i.e., where the angle between the sections is about 180 degrees). FIG. **4** also illustrates that there may be additional bolts **197** which may extend between lower section **152** and upper section **172** such that when bolts **197** extend between sections **152**, **172**, the sections **152**, **172** are locked in position such that they may not pivot about hinge **162**. When bolts **197** are removed as illustrated in FIG. **2**, upper section **172** may be pivoted about hinge **162** relative to lower section **152** (reference number **199** indicates the slots where the bolts were removed). If both bolts **197** and bolt **196** are removed, upper section **172** may be separated from lower section **152** as illustrated in FIG. **13**. A similar joint **168** with another bolt **160** may connect similar flanges of rear leg **108**'s lower section **158** and upper section **178**. Note that although two bolts **197** are illustrated in FIG. **4**, any number of bolts, or even no bolts **197**, may be used in a particular embodiment.

As illustrated in FIGS. **1-2** and as discussed above, rear legs **106**, **108** also may be comprised of multiple sections or members. As illustrated in the embodiment of FIGS. **1-2**, rear leg **106**'s lower section **156** may be connected to upper section **176** by way of joint **166** which is illustrated in FIGS. **5**A-**5**B. FIG. **5**A shows two bolts **201** which extend between the sections **176**, **156** such that the two sections **156**, **176** are connected and together comprise rear leg **106**. FIG. **5**B illustrates joint **166** when bolts **201** have been removed from slots **203** and the two sections **156**, **176** may be separated such as when boat cover **100** is in a folded state as discussed in detail below.

FIG. **6** illustrates a clamshell-type clamp or attachment means such as that illustrated in the exemplary embodiment shown in FIGS. **1-2** which shows clamps **180**, **190**, **200**, **210**. In the illustrated embodiment, proximal ends of legs **102**, **104**, **106**, **108** are attached to cover portion **110**. In the exemplary embodiment, clamshell-type clamps are positioned at proximal ends of each of legs **102**, **104**, **106**, **108** such that the clamps secure the cover portion to the legs. It will be appre-

ciated that in some embodiments, other attachment means may be utilized to attach the legs to the cover portion including, but not limited to, screwing, gluing, bonding, welding, various clamps, connecting plates, and hook and eye. FIG. **6** illustrates that the clamps may include a plurality of slots **181** for receiving bolts in order to secure the two halves **182**, **184** of the clamps together while securely holding a portion of cover portion **110** between the halves.

In more detail, the illustrated embodiment of FIG. **5** shows leg **102** attached to cover portion **110** cross member **120** by way of a clamshell-type clamp **180**. The bottom half **182** of clamshell-type clamp **180** may be attached to first leg **102** by welding or other means. In this exemplary embodiment, a corresponding upper half **184** of clamp **180** is secured to bottom half **182** with a plurality of screws or bolts such that clamp **180** is secured to both a leg and cover portion **110**. It will be understood that other means are suitable for securing the legs, for example front legs **102**, to cover portion **110**. Similar clamps may be affixed to one or more of the remaining legs in order to secure the legs to cover portion **110**.

In the exemplary embodiment shown in FIGS. **1-2**, clamps **180**, **190**, **200**, **210** secure respective legs **102**, **104**, **106**, **108** to various cross-members of cover portion **110**. In the illustrated embodiment, clamp **180** secures leg **102** to cross-member **120**, clamp **190** secures leg **104** to cross member **120**, clamp **200** secures leg **106** to cross member **122** and clamp **210** secures leg **108** to cross member **122**. By using clamps **180**, **190**, **200**, **210** to secure the various legs to various cross members, the clamps may be placed at various locations on the cross-members such that boat cover **100** may be placed onto variously sized and dimensioned boats (i.e., the space between clamps **180**, **190** may be increased if the boat is wide and the space between them may be reduced if the boat is narrow). Further, and as will be known by those of skill in the art, both cover portion **110** and the base structure may be comprised of any number of cross members or braces in order to provide additional structural integrity or mounting points both as attachment points and in order to secure other apparatus to the cover portion or the base structure. Further, although illustrated with the various legs being secured to various cross members of cover portion **110**, the legs may be attached to other parts of the cover portion including the outer perimeter as identified by front cover portion **112**, side portions **114**, **116** and rear portion **118**.

The exemplary embodiment of FIGS. **1-2** also illustrate a plurality of optional braces and/or cross members including a lower cross brace **126** between front leg **102** and rear leg **106**, a lower cross brace **128** between front leg **104** and rear leg **108**, an upper cross brace **130** between front leg **102** and rear leg **106**, and an upper cross brace **132** between front leg **104** and rear leg **108**. Use of such braces can increase the structural integrity of boat cover **100** by way of the base structure in concert with cover portion **110**. In other embodiments, such braces and cross members provide convenient locations for mounting other devices such as electronic navigational equipment, rod holders, speakers, etc. A further brace or braces may extend between front legs **102**, **104** and/or rear legs **106**, **108** in order to provide greater structural support for boat cover **100**. In one embodiment, a brace may extend from front leg **102**, through a center console of a boat and then to front leg **104**. In such an arrangement, the center console is able to provide additional stabilization to boat cover **100**.

B. Cover Portion

FIG. **7** illustrates the exemplary embodiment shown in FIGS. **1-2** in a partially folded or "not extended" state. FIGS. **1**, **2** and **7** show cover portion **110** comprising a front cover portion **112**, first side portion **114**, second side portion **116** and rear portion **118**. Cover portion **110** may comprise any number of cross members and the illustrated embodiment comprises cross member **120**, cross member **122**, and cross member **124**. Each section also may be comprised of any number of subsections, for example, in an exemplary embodiment illustrated in FIG. **8**A-**8**B and FIG. **9**, cover portion **110**'s front cover portion **112** comprises first member **250** and second member **252**, first side portion **114** comprises first member **254** and second member **256**, second side portion **116** comprises first member **258** and second member **260**, and rear portion **118** comprises first member **262** and second member **264**. Similarly, cross member **120** comprises first member **266** and second member **268**, cross member **122** comprises first member **270** and second member **272**, and cross member **124** comprises first member **274** and second member **276**.

FIG. **9** shows the embodiment of FIGS. **8**A-**8**B wherein the various members and cross members are in a partially disassembled state such that cover portion **110** comprises four quadrants **328**, **330**, **332**, **334**. FIG. **9** also illustrates that front cover portion **112**'s first member **250** has an attachment end **278** that, in the illustrated embodiment, includes two slots **279**. Similarly, front cover portion **112**'s second member **252** includes an attachment end **280** with two slots **281**. In an exemplary embodiment, attachment end **278** may be connected to attachment end **280** by way of screws or bolts which extend through one of the sets of slots **279**, **281** and is received by the other set of slots **281**, **279**. Thus, a user may assemble cover portion **110** by simply inserting some screws or bolts though one set of the slots and thus connect the two member of front cover portion **112** together. Similarly if the user wants to disassemble front cover portion **112**, they can simply remove the bolts. The ability to break down front cover portion **112**, and the other sections of cover portion **110**, is particularly useful when shipping the components as they will fit into a smaller package than if cover portion **110** or front cover portion **112** were single unitary components. Though the means illustrated to connect the various members is illustrated as a plurality of slots and bolts or screws, numerous other methods may also be utilized including, but not limited to, screw connections, push-button connections, spring-biased connections, gluing, bonding, welding, and swaging one pipe/tube to a smaller diameter pipe/tube and then bolting, or otherwise attaching or coupling, adjoining pipes/tubes together. Further, in some embodiments, the various members may be permanently connected to other members. Such a permanent fixed configuration may be desirable if the user is not going to disassemble the various sections.

Similarly to front cover portion **112**, first side portion **114**, second side portion **116** and rear portion **118** may be comprised of multiple sections such as illustrated in FIG. **9** in which first side portion **114** comprises first member **254** with attachment end **282** and second member **256** with attachment end **284**; second side portion **116** comprises first member **258** with attachment end **286** and second member **260** with attachment end **288**; and rear portion **118** comprises first member **262** with attachment end **290** and second member **264** with attachment end **292**.

The various cross members **120**, **122**, **124** may also be comprised of various members as illustrated in FIG. **9**. FIG. **9** illustrates cross member **120** comprising first member **266** with attachment end **294** and second member **268** with attachment end **296**; cross member **122** comprising first member **270** with attachment end **298** and second member **272** with attachment end **300**; and cross member **124** comprising first member **274** with attachment end **302** and second member **276** with attachment end **304**.

As discussed above, cover portion **110** also may comprise one or more hinges such that the cover portion can be folded as shown in various embodiments in various figures. FIGS. **2** and **7** illustrate two conditions in which cover portion **110** is in a folded or "not extended" position. In the exemplary embodiment of FIGS. **1-2** and **7**, side portions **114**, **116** each include a hinged connection between their first and second members, **254**/**256** and **258**/**260** respectively.

FIGS. **10**A-D illustrate various views of an exemplary cover portion of the present embodiment. FIG. **10**A illustrates relationships between various cross-members **122**, **124** and a hinge point/hinge bolt **404** such as a distance d**1** between a first cross member **122** and hinge point/hinge bolt **404** (distance d**1** is also the same distance as between hinge point/hinge bolt **406** and cross member **122**) and a distance d**2** between a second cross member **124** and hinge point/hinge bolt **404** (distance d**2** is also the same distance as between hinge point/hinge bolt **406** and cross member **124**). In this exemplary embodiment, hinge point/hinge bolt **404** connects second side portion **116**'s first member **258** and second member **260** and hinge point/hinge bolt **406** connects first side portion **114**'s first member **254** and second member **256**.

The exemplary embodiment illustrates hinge point/hinge s **404**, **406** as connecting the various members, although numerous other means may be utilized to hingedly connect the various members. Further, the various members may be removably connected such that they may be completely disconnected from each other in order to fold or collapse the cover portion such as if the hinge bolts were completely removed.

Note that although the exemplary cover portion illustrated in FIGS. **10**A-D has three cross members and two hinge points, any number of cross members, or even none at all, may be present in accordance with the various embodiments. Further, any number of hinge points may be present, i.e., two as shown, or even more or less. In an exemplary embodiment with no cross members, the hinge point/hinge bolts are positioned the distance d**1** from one end of the cover portion and the distance d**2** from an opposite end of the cover portion.

In the exemplary embodiment shown in FIGS. **10**A-D, in addition to hinge bolt **406**, two support bolts **410**, **412** may be utilized to maintain the cover portion in the condition illustrated in FIG. **10**A, i.e., the "extended" position/state. Hinge bolt **404** may similarly be supported by one or more bolts **414**, **416**. FIG. **10**B illustrates a condition in which bolts **410**, **412** have been at least partially removed from slots **411**, **413** in second member **256** such that the various members are no longer in a locked state and the cover portion may be folded as illustrated. An angle Φ is be defined as the angle by which the cover portion has been folded as illustrated in FIG. **10**B. Angle Φ may range from approximately 0° to about 10° when rear portion **118** is pivoted downward as illustrated, or rear portion **118** may be pivoted upward such that angle Φ may range from 0° to about −110°. In other embodiments, angle Φ may range from approximately −180° to 180° depending on the geometry of the boat cover and the configuration of the boat.

FIG. **10**C illustrates the exemplary hinge portion of the exemplary cover portion of FIGS. **10**A-B between first member **254** and second member **256**. In this exemplary embodiment, the relationship between slots **411**, **413** in second member **256** can be seen relative to slots **415**, **417** in first member **254** when second member **256** is pivoted relative to first member **254** about hinge point **406**.

In the exemplary embodiment, three bolts **406**, **410**, **412** are used to provide extra strength as various equipment such as electronic equipment and fishing gear may be attached to the fore or aft portions of cover portion **110** though this number of bolts may be increased or decreased in a given embodiment. It will be recognized that various other connections are possible for the various embodiments including various types of hinges and connections. Further, rather than being hingedly connected, it is desirable in some embodiments to be able to completely separate the first and second members such as for disassembling boat cover **100** for storage or for shipping purposes. In various exemplary embodiments, cover portion **110** may be in a position other than the "extended" position as shown in FIG. **1**. As mentioned above, such a "not extended" position may be as illustrated, for example, in FIGS. **2**, **7**, and **10**D, or, in an alternative embodiment, the cover portion may be in a not extended position by breaking down the cover portion into two or more pieces (such as, for example, as illustrated in FIG. **9**). In another exemplary embodiment (not shown), cover portion may be in a not extended position by telescoping one or more segments or members of the cover portion relative to other segments or members (i.e., telescoping a rear portion of the cover portion toward or away from a front cover portion, or a side portion of the cover portion toward/away from a second side portion of the cover portion).

Various embodiments of the boat covers also may include a screen **310** as shown in FIG. **7**. Screen **310** may provide a layer to block sun or rain or fulfill other purposes such as presenting a surface on which to place advertising or a surface for mounting various devices such as electronics. Screen **310** may be attached to cover portion **110** in a variety of manners including, but not limited to, elastic cords, rope, hook and loop (i.e., Velcro ®), snaps, and zippers. In the embodiment shown in FIG. **7**, rope **314** is threaded through a plurality of eyelets **316** in screen **310** and around various members of cover portion **110**.

In some embodiments and as discussed above, the various cross members of cover portion **110** (or in the case that there are no cross members, from the ends of the cover portion) may be configured such that cover portion **110** may be folded or otherwise transformed from an extended position to a not extended position without causing any additional tension to screen **310**. In the illustrated embodiment of FIGS. **1-2**, for example, cross members **122**, **124** are spaced a sufficient distance from each other and the two hinge points **404**, **406** that when cover portion **110** is folded as in FIGS. **2** and **7**, screen **310** is not under any additional tension than when cover portion **110** is in the extended position of FIG. **1**.

In one exemplary embodiment distance d**1** is approximately equal to distance d**2**. In another exemplary embodiment, d**1** is approximately equal to one-half of distance d**2**. In another exemplary embodiment d**1** and d**2** are each at least 0.5 times an outer diameter of the nearest cross member (or end member if it is closer to the hinge or if there are no cross members). In another exemplary embodiment, distances d**1** and d**2** are each at least 1.0 times an outer diameter of the nearest cross member. In another exemplary embodiment, distances d**1** and d**2** are each at least 2.0 times an outer diameter of the nearest cross member. Note that for the preceding embodiments, that if there are no cross members, then the distances are taken to be the distance from an inside edge of the end of the cover portion as discussed above.

C. Materials

The boat cover embodiments described herein may be constructed from various materials. In one exemplary embodiment, hardened aluminum, such as the 6000 series and in particular grades 6061 or 6063 is used for constructing the base structure including the front legs, rear legs, various braces and cross members, base members and clamps as well

as the cover portion. Where aluminum is chosen, if the boat cover will be given a polished finish, then 6063 grade is used. The aluminum is heat treated (e.g., from a T5 to a T6 temper). In another embodiment stainless steel may be used for the base structure and/or cover portion. The cover portion, legs and any cross-members or braces may be prepared by milling, then cutting, bending, and welding as necessary, then heat treating, and finishing by powder coating, by anodizing and polishing, or by other similar techniques common in marine use.

The optional screen may be comprised of any suitable material including, but not limited to, cloth, nylon, canvas, tarpaulin, and plastics. In one exemplary embodiment, the screen is comprised of a malleable and resilient material such that it is able to be folded many times such as would occur if the cover portion is folded on a regular basis. In other exemplary embodiments, the screen is comprised of a material which is resistant to stains including molds an mildew and is otherwise able to stand up to environmental conditions without deteriorating. In yet another exemplary embodiment, the screen comprises Sunbrella® fabric available from Glen Raven, Inc.

II. Methods of Folding Boat Covers

When using certain boat cover embodiments such as the boat cover **100**, there may be a need to fold it down from time to time when it is not in use or to go under bridges and other overhead obstructions. Specifically, when placing a boat canvas or tarpaulin over the boat, when towing the boat or placing the boat onto an overhead lift, one may desire to fold down the boat cover **100**. In FIGS. **1**, **11**A, and **14**, the boat cover **100** is in the fully upright position as when on a boat structure **400** of FIG. **11**A. Upon the user deciding to fold down the boat cover **100**, the user can (1) remove the one or more bolts from rear legs **106**, **108** (see, for example, FIGS. **5**A-**5**B) such that the upper and lower sections of the rear legs are no longer affixed to each other, (2) remove the one or more bolts from front legs **102**, **104** which prevent upper sections **172**, **174** from pivoting relative to respective lower sections **152**, **154** (see, for example, FIGS. **2** and **4**), (3) pivot upper sections **172**, **174** of the front legs relative to lower sections **152**, **154** which will also cause cover portion **110** to be pivoted as it is attached to the legs (see, for example, FIG. **2** and FIG. **11**B where the amount of pivot is shown as angle θ), (4) remove the one or more bolts from cover portion **110** such that the rear portion **118** of cover portion **110** can pivot relative to front cover portion **112** of cover portion **110** (see, for example, FIGS. **10**B-**10**C), and (5) pivot cover portion **110** to a desired position (see, for example, FIG. **10**D and **11**C).

In accordance with steps (1)-(5), the boat cover may be converted from the upright extended condition of FIG. **1** to the reclined/not extended position shown in FIG. **2** such that a boat canvas or boat lift may be used. Note that it may be desirable when folding down the boat cover **100** in this manner to utilize some padding such as a life vest between the points of contact of the cover portion and each of the legs to preserve the finish of both the boat cover **100** and the boat.

III. Methods of Packaging Boat Covers

In addition to folding down into a manageable configuration, boat cover **100** may also be packaged in a disassembled state to be transported. As shown in FIGS. **11** and **12**, this disassembled boat cover embodiment **100'** may be packaged in a relatively small container **250**. FIG. **13** illustrates an arrangement of four quadrants **328**, **330**, **332**, **334** of cover portion **110** and leg subassemblies **320**, **322**, **324**, **326**. FIG. **13** illustrates a stacking order of the various components illustrated in FIG. **12**.

The boat cover embodiment **100** described above includes many features. However, various embodiments of the boat cover may include one or more of these features while omitting others. Accordingly, it will be appreciated that these various features discussed above with reference to FIGS. **1-12** may be present alone or in combination, depending upon the particular needs being addressed by the boat cover embodiment being constructed.

While illustrative embodiments have been particularly shown and described, it will be understood by those skilled in the art that various other changes in the form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A boat cover, comprising:

a cover portion including a plurality of spaced leg attachment points, the cover portion providing a framework upon which a continuous screen is attached in an outstretched orientation over the framework such that the continuous screen spans the space between the plurality of leg attachment points, the framework including a first portion interconnected to a second portion and where the continuous screen spans over the first and second portions; and

a base structure, said base structure including:

a first leg including a distal end and a proximal end, said distal end providing a boat attachment point and said proximal end providing a cover attachment point;

a second leg including a distal end and a proximal end, said distal end providing a boat attachment point and said proximal end providing a cover attachment point;

a third leg including a distal end and a proximal end, said third leg linked to said cover portion;

a fourth leg including a distal end and a proximal end, said fourth leg linked to said cover portion; and

wherein said cover portion has a first position in which said cover portion is extended so that the first and second portions of the framework lie within a first plane and a second position in which the cover portion is not extended so that the first portion lies within the first plane and the second portion lies within a second plane that is different than the first plane and wherein the continuous screen remains in the outstretched orientation over the framework and continues to span the space between the leg attachment points in both the first position and the second position.

2. The boat cover of claim **1**, wherein said first leg and said second leg each include a hinge point between said distal and proximal ends such that said first leg is comprised of an upper section and a lower section and said second leg is comprised of an upper section and a lower section.

3. The boat cover of claim **1**, further comprising at least one cross brace between said first and third legs and between said second and fourth legs.

4. The boat cover of claim **1**, wherein each leg and the cover portion are aluminum.

5. The boat cover of claim **1**, wherein said fourth and said third legs are each comprised of a lower section and an upper section wherein said upper section can be removably attached to said lower section.

6. The boat cover of claim **1**, wherein said cover portion further comprises at least one hinge such that said cover portion is transformed from said extended position to said not extended position by pivoting the first portion of the cover portion about said at least one hinge relative to the second portion of the cover portion.

7. The boat cover of claim 6, wherein the cover portion includes a first cross-member running parallel to an axis of the at least one hinge and being between the at least one hinge and an outer member of the cover portion, wherein the cover portion further includes a second cross-member running parallel to the axis of the at least one hinge and being between the at least one hinge and a second outer member of the cover portion, and wherein the continuous screen that is attached to said cover portion is outstretched over the first and second cross-members in both the first and second positions.

8. A boat cover, comprising:

a cover portion which includes at least one hinge such that said cover portion has at least two positions, an extended position and a folded position, wherein the cover portion includes a first cross-member running parallel to an axis of the at least one hinge and being between the at least one hinge and an outer member of the cover portion and wherein the cover portion further includes a second cross-member running parallel to the axis of the at least one hinge and being between the at least one hinge and a second outer member of the cover portion that is located on an opposite side of the at least one hinge from the first outer member, the cover portion further including a continuous screen spanning over both the first cross-member and the second cross-member; and

a plurality of legs at least one of which supports said cover portion.

9. The boat cover of claim 8, wherein the plurality of legs comprises:

a first leg including an end providing a boat attachment point and a cover attachment point;

a second leg including an end providing a boat attachment point and a cover attachment point;

a third leg including an end providing a boat attachment point and a cover attachment point; and

a fourth leg including an end providing a boat attachment point and a cover attachment point.

10. The boat cover of claim 9, wherein said first leg includes a hinge and said second leg includes a hinge, and

wherein a proximal end of said first leg can be pivoted relative to a distal end of said first leg and a proximal end of said second leg can be pivoted relative to a distal end of said second leg.

11. The boat cover of claim 9, further comprising at least one cross member between opposite sides of said cover portion and wherein at least one of said first leg, said second leg, said third leg, or said fourth leg is attached to said cover portion at said cross member.

12. The boat cover of claim 8, wherein at least one of said plurality of legs is comprised of aluminum.

13. The boat cover of claim 8, wherein at least one of said plurality of legs is curved.

14. The boat cover of claim 8, wherein at least one of said plurality of legs is bent.

15. The boat cover of claim 8, further comprising at least one cross brace between two of said plurality of legs.

16. The boat cover of claim 8, wherein the at least one leg that supports the cover portion includes a hinge and wherein an axis of the at least one hinge of the cover portion is parallel to an axis of the hinge of the at least one leg.

17. A method of configuring a boat cover that has at least one leg and a cover portion such that the boat cover is mounted to a boat by the at least one leg supporting the cover portion above the boat, said method comprising:

providing a screen having multiple individual points of attachment to the cover portion;

pivoting a first portion of said cover portion relative to a second portion of said cover portion while maintaining the multiple individual points of attachment of the screen to both the first portion and the second portion of the cover portion;

rotating said cover portion relative to at least a portion of said at least one leg, wherein the rotation of the cover portion relative to at least the portion of the at least one leg occurs about an axis that is parallel to an axis of the pivoting of the first portion of the cover portion relative to the second portion of the cover portion, wherein said at least one leg comprises at least one front leg and at least one rear leg, and wherein said at least one front leg includes an upper section and a lower section connected by a hinge and said rear leg includes an upper section which is removably connected to a lower section;

disconnecting said upper section of said at least one rear leg from said lower section of said at least one rear leg, and

wherein said rotating step comprises rotating said cover portion and said upper section of said at least one front leg relative to said lower section of said at least one front leg.

18. A method of packaging components of a boat cover comprising a plurality of legs and a cover portion, the method comprising:

positioning the plurality of legs one on top of another in a stacked configuration, the plurality of legs including a lower first leg portion and a lower third leg portion connected by a first cross brace, a lower second leg portion and a lower fourth leg portion connected by a second cross brace, an upper first leg portion and an upper third leg portion connected by a third cross brace, an upper second leg portion and an upper fourth leg portion connected by a fourth cross brace where positioning of the plurality of legs places the first and second cross braces at opposite sides of the stacked configuration and places the third and fourth cross braces at opposite sides of the stacked configuration, and

positioning four quadrants of the cover portion on top of one another in a stacked configuration such that the stacked configuration of the four quadrants is stacked with the stacked configuration of the plurality of legs, the four quadrants including a first quadrant with a first cross member portion, a second quadrant with a second cross member portion that is a mate to the first cross member portion, a third quadrant with a third cross member portion, and a fourth quadrant with a fourth cross member portion that is a mate to the third cross member portion.

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